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THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XLVI.—No. 9. Whole No. 669. | NEW YORK, MONDAY, MAY 2, 1887. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

Published on the 2d and 16th of each month, at No. 42 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $3.50 (15 shillings—18 francs). All payments to be made in advance. Single copies, 15 cents.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—

Western Gas Association..... 277

EDITORIALS—

Almost Ready for the St. Louis Meeting..... 278

Obituary—J. O. King..... 278

Suits for Damages..... 278

Removals..... 278

Third Annual Meeting of the Ohio Gas Light Association—Official Report—Continued from page 251..... 279

Tar as an Enricher, by E. W. Hamlin—Discussion—Report of Committee on Nominations—An Interjected Question—*Causes and Prevention of Stoppage in Burner Tips, by Eugene Printz—A Regenerative Furnace Adapted to a Small Gas Works, by Irvin Butterworth—Discussion—Second Day, Morning Session—Condensation and the Elimination of Tar, by T. A. Bates—Discussion.

Is Lofty Guide Framing Necessary for Large Gasholders?..... 284

Standard Pipe and Pipe Threads..... 285

Special English Correspondence..... 286

Oil Gas in England—New Way of Utilizing Coke—Paris Gas—The Status of Gas Engineers—Honesty is the Best Policy—Novel Views Respecting Gasholder Guide Framing—Pushing the Use of Gas Cooking Stoves.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 287

The Columbus (Ohio) Gas Company Proclaims the Dollar Rate—Cheaper Gas for Boston, Mass.—Annual Election, American Meter Company—An Item from Far-away Fargo—Public Lighting at Troy, N. Y.—A Siemens-Lungren Company for New York City—New Gas Company—Proposing to Start an Opposition Gas Company—Improvements at Montclair, N. J.—Annual Election, Rome, N. Y.—How it is Done at Brookline, Mass.—Tonawanda Appreciates the Situation—A Gas Works at Auction—Cheaper Gas for Athens, Ohio—Following in His Father's Footsteps—A Meter on Exhibition—Chartered—Jarvis Steam Plant for the Burlington (Vt.) Gas Company—Consolidated at Brattleboro, Vt.—The Cost of It—Hastings' Gas Rate—Ventura (Cal.) has Gas—Electric Light for Bismarck City, Dak. Ter.—Coke is Worth Something in the Lone Star State—Street Lighting at Newburgh, N. Y.—Moribund—Sorry to Know that He Goes so far from Us—Incorporated—Col. Benson's European Studies.

CORRESPONDENCE—

Public Lighting in Brooklyn, N. Y..... 289

The Market for Gas Securities..... 290

Messrs. Bartlett, Hayward & Co., of Baltimore, Md., now control all right in the Wilkinson process for the manufacture of water gas. Their announcement in this regard will appear in our next number.

[OFFICIAL NOTICE.]

Western Gas Association.

SECRETARY'S OFFICE,
QUINCY, ILLS., April 25th, 1887.

The Tenth Annual Meeting of the Western Gas Association will be held at St. Louis, Mo., on the 11th, 12th and 13th days of May. The rates at the Southern, fixed upon as the headquarters of the Association, will be $3 and $3.50 per day.

The business sessions will be conducted in the lodge room of the Elks' Club, corner of Sixth and Walnut streets, one block from the hotel. The convention will be called to order at ten o'clock, on the morning of Wednesday, May 11th, by President John Fullagar.

Your Secretary is reluctantly compelled to forego the pleasure, which he had both hoped and expected to enjoy, of announcing for our Association's entertainment in this the last issue of the JOURNAL which will reach our members before the date of the meeting, the anticipated presentation of a generous number of titled papers. All that I am able to state in this connection is that several essays have been promised, but as their authors have failed to notify me of the titles of their contributions in time for publication, I cannot make the desired announcement.

I do not know that any apology on the part of the Secretary for this dissatisfactory state of affairs is necessary, or expected. I certainly have tried hard enough to induce our members to put forward their best efforts for the good of the Association, but the success realized seems at present entirely disproportionate to the labor expended. The old wheel horses who have stood by us so faithfully in the past are disinclined to continue their work with increasing regularity, thinking, no doubt (and thinking rightly), that it is quite time for others to don the harness. If we had an Association composed exclusively of Somervilles, McMillins, Kings, Ramsdells, Hydes, Chollars, Howards, Gimpers, and possibly a few, a very few, others, the work of a Secretary would be immeasurably lightened, so far as the securing of literary contributions is concerned; but it is too much to expect these members to step to the front at each succeeding meeting, when we have so many others abundantly qualified for the task, if they would only take the trouble to perform the duty.

For the above reason, if for no others, it would seem as though the time had arrived when it has become necessary to adopt some such plan as was chosen by the Ohio Gas Light Association, and which, in practice, has been attended with such satisfactory results.

Too much praise cannot be bestowed upon our Local Committee of Arrangements—Messrs. J. D. Thompson, T. G. Russell, and Jas. Green—for the commendable zeal and energy that they have displayed in providing for the comfort and pleasure of those who will be in attendance at our St. Louis meeting. Your Secretary risks nothing in saying that the social features of the approaching reunion will be of a most pleasant character, as all whose good fortune it may be to participate therein will be quite willing to testify.

In closing, allow me, in behalf of the Western Gas Association, to extend to the members of all kindred societies a most hearty invitation to be present, assuring them that we will all, each and every one, endeavor

to make them feel that their welcome is as warm as we trust that they may find their visit pleasant. A. W. LITTLETON, Sec'y.

ALMOST READY FOR THE ST. LOUIS MEETING.

The tenth birthday of the Western Gas Association, if one may judge of what is to be from the rumors which reach us by way of St. Louis in regard to the outlook, is certain to be celebrated with that heartiness which usually accompanies a sound and vigorous growth; but, nevertheless, the advices from Quincy, Ill., in regard to the papers that are catalogued, are not so reassuring. However, if there be some doubt in that direction, even the most chronic and erratic fault-finders must at once concede that Secretary Littleton has performed his whole duty in the premises. The genial and persistent member from Quincy has left no stone overturned in the performance of his official duties, and we take it that his pointed reference to what would be the case were the Association composed exclusively of Somervilles, McMillins, Ramsdells, and others of similar kind, will be appreciated at a glance. These members have borne the burden for quite a while, and need not offer any explanation for their present silence. However, since the unexpected is pretty often encountered, perhaps many of the hitherto silent members of the Association are preparing a surprise for their fellows, and in the hope that such is the case, and that Secretary Littleton's really arduous work will be compensated for by a rousing development of "the unexpected," we must await the result at St Louis. Perhaps the present paucity of the paper list will work advantageously in that a greater margin of time can be allotted to the discussion of subjects which, like the ghost of ancient renown, will not down. Prominent among the moot points are—legislation affecting the business of the gas maker, and the combined supply of gas and electricity. During the present session of the Illinois Legislature a plan for placing the gas business of that State under control of a State Commission was proposed by, we believe, Senator Cable; and while we are not aware as to what, if any, final legislative action was taken in this particular case, it nevertheless instances the drift of sentiment, and points to the fact that, sooner or later, the State intends to figure more prominently than it has in the past—many will say that that is an impossibility—in its dealings with the gas suppliers. New York seems to be anxious to go on with the work—two or three commission measures are now before the attention of the Solons (?) of the Empire State; the Senate of the United States wishes to dictate to the Gas Company operating in the District of Columbia; the session of the New Jersey Legislature (fortunately it has ended its labor for the year) witnessed an attempt to interfere in gas matters. And so it goes. The agitation on this question of control is not confined to any one State; and we therefore hold that, if interference is to come, the gas men ought to get themselves in readiness, and so be prepared to oppose that which is unjust, or to uphold the contrary. The other subject—combined gas and electric light supply—is also one of the "burning questions" of the day; and since it appears that the effects of electric competition have been perhaps more severely felt by Western gas makers than by their brethren of the East, the members of the Western Association seemingly ought to be thoroughly qualified to speak by the book in formulating a verdict on the proposition.

In respect of the social features of the gathering, neither labor, time nor money seem to have been stinted by the local committee in their preparations for the entertainment of the Association and its guests. Mention of the latter spurs us on to say that many members of the Eastern fraternity have signified their intention of paying their respects in person to their Western brethren—even though the Interstate bill is in full feather. We have received an intimation that the entertainment programme provides for a banquet at the Southern Hotel, a lunch at the Club House of the St. Louis Jockey Club, a steamboat excursion, and many minor items that go to make a most imposing total. Indeed, it is but necessary to remember the characteristics of the gentlemen who compose the committee in order that the completeness of their preparations can be vouched for.

One cloud, however, must rest over what otherwise would be a meeting fraught with unalloyed pleasure, and that leaven of regret springs from the knowledge that the Association must, in accordance with the Divine mandate that called away from earth and his fellows the spirit of the late Mr. J. O. King, of Jacksonville, Ills., mourn deeply for one who was justly entitled to the name of founder of the Western Association. His labors, however, are keenly appreciated by those who have so often listened and gained by his counseling; and their regret, although deeply and firmly held, will be tempered in the knowledge that fullness of years and merited honor were accorded him; and of anyone who resigns the burden of life, what can be said that offers greater consolation to those who remain?

OBITUARY—J. O. KING.

Death has dealt most harshly with the fraternity so far in the present year, and the latest stroke of the destroyer obliges us to record the death of Mr. J. O. King, Supt. of the Jacksonville Gas Light Company, and the first President of the Western Gas Association, whose decease occurred on the morning of April 16. Deceased had suffered for some months from the effects of an attack of inflammation of the bowels, and those about him were gradually prepared for the final sad ending.

Mr. King was born, in Enfield, Conn., on May 18, 1814, remaining in his native town until 1837, when he first visited Jacksonville, to which place he was called by reason of certain business interests, and wherein the balance of his busy and successful life was spent. In 1840 he returned temporarily to the East, the objective point of his visit being Amherst, Mass., where he was united in marriage to Miss Sarah L. Dwight, shortly after which ceremony the youthful couple journeyed to Jacksonville, there to live a life of unbroken harmony that only ceased with the death of Mrs. King, in May, 1882.

Mr. King had, in the interim of 1837–57, been interested in various local business enterprises; in fact he was most intimately connected with the prosperity of his adopted city, and aided it not a little by willing expenditure of brain and muscle. In 1857 the local gas plant, which had been built by speculators, was in wretched condition, and the residents clamored loudly for a change in the policy of the Company. Mr. King and associates thereupon determined to secure control, which was speedily accomplished, and the work of rejuvenation was commenced. This was no slight matter—for many and startling changes have been wrought in Illinois within the past 30 years—at that time, but Mr. King, who assumed the superintendency, being gifted with rare executive ability, coupled with a studious mind, soon evolved order out of chaos, and placed the Company's affairs on a sound footing. He remained the nominal Superintendent up to the hour of his death, although, in later years, the brunt of the work has been borne by his son, Mr. E. J. King, who is also well known to the fraternity of this country. Like all men who are disposed to look ahead in providing for the future of the towns in which they live, Mr. King was rather savagely attacked by the opponents of a plan proposed by him for securing a proper system of water supply for Jacksonville. Almost single-handed he contended for the project, and was finally successful; further, the pleasure of living to see the day when those who opposed him on that question later on acclaimed him a public benefactor, was his. The Insane Hospital and the Asylum for the Blind were located at Jacksonville largely by his efforts, and in every local charity trace can be had of his name. He was many times elected by his fellow townsmen to fill places of public trust, the last position of that nature being held by him in 1874, when he occupied the Mayoralty chair. Mr. King was an ardent abolitionist, and it is matter of record that, several years before the war, the freedom party, of Morgan county, Ills., was organized by Mr. King and six kindred spirits. The pages of the JOURNAL, Vol. XXIX., will reveal the share borne by deceased in the formation of the Western Gas Association. He was actually its founder, for the initial circular call emanated from him, and he was also the first formally elected President of that organization. In its progress he was ever deeply interested, and the debt which it owes him can best be repaid by remembering his advice and acting in consonance therewith. Of his immediate family two sons, Wm. M., of this city, and E. J., of Jacksonville, also two daughters, Mrs. E. Dwight, of New York, and Miss Mary, of Jacksonville, survive. In conclusion, we think the following extract, from an obituary notice of deceased, published in the Jacksonville *Herald*, will best tell the story of how he was regarded by his fellow townsmen:

"He was ever a genial companion, and foremost in every good word and work for the public good. He was a model husband and father, and was ever ready to give material aid to a young man who was striving to do his best. His kindness to us when struggling in early life will never be forgotten." Very simple words; but they bear most eloquent testimony.

SUITS FOR DAMAGES.—On April 16, suits (thirteen in number) were instituted against the Troy Fuel Gas Company, on behalf of those who suffered on account of the January disaster, hitherto reported in the JOURNAL.

REMOVALS.—The offices of the Bartlett Street Lamp Manufacturing Company are now to be found at Nos. 40 and 42 College Place, this city. Mr. M. J. Drummond, dealer in cast iron gas and water pipe, etc., will hereafter be found in handsome apartments in that wonder of office structures, the Equitable Building, Broadway.

[Official Report—Continued from page 251.]

Third Annual Meeting of the Ohio Gas Light Association.

Held at the Beckel House, Dayton, Ohio, March 16 and 17, 1887.

First Day—Evening Session.

Mr. E. W. Hamlin, of Wilmington, read the following paper, on

TAR AS AN ENRICHER.

Mr. President, and Members of the Association:—Only a few years since the tar made at gas works—at least the small ones—was considered a nuisance, and how to get rid of it was the query that occupied the mind of the gas man. If by chance, or otherwise, any of it found its way into a stream of water, the authorities would "go for him" with the combined dignity of themselves and the law, and compel its abatement. Gradually its latent wealth has been uncovered, and it has already taken so firm a hold in the commercial *utilities* of the world that one would hardly recognize it as the same material known as a nuisance. While it is true that only the large works can avail themselves of all the properties contained in tar, and by that means be able to sell their gas at a less price than the small works, still I believe there is a profit for us with benches of threes other than the local demand for decorating fence posts, destroying potato bugs, or converting into coke, by burning the tar and selling the coke. It is my purpose in this paper to tell you of an apparatus I have constructed for enriching gas with tar, extracting naphthaline from gas, and the results obtained from its use.

The machine is very simple in its construction, and can be put into a works at a small cost; and if at any time you should conclude to abandon it as an enricher (which time will never happen if it gives the same satisfaction we get), all you have to do is to unscrew the stopper, and the gas will pass on the same as before the enricher was put in.

The process is simply passing gas with steam (or separately) through hot tar. To accomplish it I took a galvanized iron boiler, of the kind the plumber puts in your kitchen to heat water, and through the inlet end I run a wrought iron pipe, the size of the main, to within 12 inches of the outlet end, allowing it to project from the inlet end far enough to make a lead joint with the main, previously cut and taken out to give room for the enricher. With threads cut on the wrought iron pipe, and with lock-nuts, it was fastened to the inlet end of the boiler, and a tight joint secured. At the outlet end it is held in position by a stirrup, so that it stands its entire length about six inches from the bottom of the boiler. On the lower side of this wrought iron pipe, holes were drilled for one-inch pipes, sufficient for the capacity of the main pipe and 12½ per cent. to spare. These one-inch pipes extend to within two inches of the bottom of the boiler. Near the top of the outlet end of the boiler is a short wrought iron pipe, same size of the main, secured to the end of the boiler with lock-nuts, and the main in the works by a lead joint. This is the outlet pipe for the passage of the gas. Below this outlet pipe, and immediately opposite the wrought iron pipe in the boiler, an iron rod runs into the latter. It has a plug, with guides, on the inside end, and so arranged, with threads, on the rod and the end of the boiler that by simply turning the rod the plug is forced into the end of the main pipe in the boiler, thus compelling the gas and steam to pass through the tar. By unscrewing the rod the plug is removed from the pipe, permitting the gas to pass with the same freedom as if the enricher was not there. A revolving gate valve would be more convenient, as a slight turn would immediately stop or permit the flow of the gas and steam. In the bottom of the boiler, at the outlet end, is the tar seal, also the tar outlet, so arranged that by simply turning this outlet pipe the seal can be raised or lowered.

The machine is located in the cellar between the exhauster (steam-jet) and the washer. The tar can enter directly from the hydraulic main seal by a pipe (with proper seal) in the enricher, then drop into the galvanized iron boiler through hugging the hot main, and run to the inlet end of the enricher, by which means it becomes heated; or through the main (with seal) and become heated and carried along by the gas and steam as they pass on their way to the enricher. It is there subjected to the action of the hot gas and steam, and passes the entire length of the enricher before it reaches its outlet. This agitation of the hot tar by the gas and steam not only hastens the dissolution of the hydrocarbons, but prevents "pitching."

At first we tried a 2½-inch seal in the enricher, but found we had enough pressure to carry more. The greater the seal the more tar comes in contact with the gas and steam, and the more illuminating oils are liberated to be absorbed by the gas. I have made provision for a steam pipe to run through the tar for the purpose of heating and scouring it, and to act as an exhauster for the enricher in case there should not be sufficient pressure to force the gas through the works; but, thus far, we have not had occasion to use it. There are hand holes for the easy adjustment and inspection of the machine. I hope this description is sufficiently plain to enable you to get the idea. Let us now pass to the results.

By a careful analysis of the tar before it entered the enricher and after it had passed through it, it was found that 32.7 per cent. of the hydrocarbons had been extracted from it, and carried off with the gas—not only increasing the candle power, but the yield as well. I will add that where hot air was substituted for steam the results were not as favorable.

So much for the testimony of the laboratory. We will now go to the street main. We use the jet photometer made by the American Meter Company. From a series of careful consecutive observations, made before the enricher was started, and the same number after, we found the candle power of the gas was increased 11.33 per cent. This was after the gas passed from the holder. Nor is that the limit, for I feel safe in saying that this process will extract more of the hydrocarbons and add to the candle power and yield.

I regret I am not able to give you, from analysis, the effect this process has on naphthaline; but we know about its easy solution in hot water, and for that reason does not the steam and hot ammonia water assist in removing it? It does; and as evidence of that fact I will state that, after we had commenced the use of iron sponge, we found traces of naphthaline in our purifiers, also in our meters—we do our own meter repairing; but since this process was adapted it has disappeared. We have not noticed any deterioration in the fuel properties of the tar.

In fine, this gain has been accomplished without one cent. of extra expense, save the cost of the machine. It requires no attention. There are no choked stand-pipes to be burned out, or bearings that require oil. On the contrary, it takes care of itself, and the sound it sends forth when at its best, coupled with the satisfaction it gives, is so melodious to the ears of the men about the works that they call it "their organ."

Discussion.

Mr. Coverdale—About what would be the cost of getting up such a machine as that?

Mr. Hamlin—I think the one described cost more than another would, for the reason that the workmen who built it had to be instructed, and a part of it was not done correctly. I think it cost something like $60; at least that is the cost for a works of the size of ours. You can make your own calculation as to what it would cost for a larger plant. The analysis of the tar was made shortly after we started. I have reason to think that to-day we take more of the hydrocarbons out than we did then. I will state that the candle power I have given is a record of 50 consecutive observations taken before and after the enricher was started. The reason I did not take a greater number of observations was because, prior to starting with it, I did not have a record of candle power that I could rely on. At that time we were in the habit of taking the candle power only at intervals; but when we contemplated starting the enricher we took it every day.

Mr. Printz—I would like to ask Mr. Hamlin what yield he gets from his coal, and what his candle power was before he introduced this machine.

Mr. Hammond—I cannot be accurate as to our yield last year.

Mr. Coverdale—What would the coal yield supposing you now dispensed with the enricher apparatus?

M. Hamlin—The yield we obtained the year before starting the enricher device was 4.65. I cannot be accurate as to last year, because our station meter was not correct. The water line was not kept at proper level. It is the same with our unaccounted-for gas. I cannot speak correctly as to that. In the year 1885 the percentage was 10.83, and our books show that in 1886 our unaccounted-for gas amounted to between six and seven per cent., which latter I know to be incorrect. The average of our candle power before putting in that enricher device was 17.564; after we put the enricher in it was 19.554.

Mr. Allison—How long have you been using that apparatus?

Mr. Hamlin—We put it in early last fall, and have been using it almost constantly since. I wish to add that I have not yet patented this device, but intend to apply for a patent.

On motion of Mr. Coverdale a vote of thanks was passed to Mr. Hamlin.

Report of Committee on Nominations.

Mr. Huntington—The Committee instructs me to report the following names for officers of this Association during the coming year. Under your by-laws this Committee is required to present two nominees for each office.

President—Eugene Printz and Thomas Wood.
Vice-President—Joseph Gwynne and John Fullager.
Secretary—Irvin Butterworth and Charles M. Converse.
Treasurer—E. W. Hamlin and Edward C. Gwyn.

The President announced that the election would take place when all the papers had been read and discussed.

AN INTERJECTED QUESTION.

Mr. Converse—One of my consumers wanted me to bring this question before the Association: "Can coal gas be used with any degree of economy, as compared with anthracite coal at $8 per ton, in generating steam to heat a building of 10 or 12 rooms—labor and items of convenience also to be considered—the price of gas being at $2 per thousand?" Perhaps the question had better be put: "At what price would gas have to be sold to compete with coal at this price?"

The President—I will say, in answer to the question, that wherever coal is used constantly (where the fire is kept up the whole 24 hours) it would not be possible for gas to compete with anthracite coal at the prices given. It would not be possible even were the gas at $1 and the anthracite coal at $10. In fact, the difference between the heating powers of the two is so enormously great that I do not want to state it in the presence of the reporters.

Mr. Eugene Printz, of Zanesville, now read his paper on

CAUSES AND PREVENTION OF STOPPAGE IN BURNER TIPS.

The stoppages in burner tips are due to causes both mechanical and chemical. Those which we would term mechanical are produced by fine particles of rust, or any other dirt that may happen to be in the pipe. The particles may be loosened by a jar, and then carried by the flow of gas to the tip, where, should the material so carried be larger than the cross-opening in the tip, it is arrested, and finally, by its accumulation, creates a complete shut off of the gas. Stoppages of this kind are easily prevented by blowing or clearing out the pipes thoroughly.

Again, we have cases where the tarry vapors are carried mechanically in the gas past all the gas works machinery, and are found, in the shape of a gummy soot-substance, at the burner tips. This certainly should not be, and is due to an imperfect apparatus for the separation of the tarry matter.

Mechanical causes are easily accounted for, and, we might say in many cases, are as easily remedied or prevented; but those of a chemical nature are often very difficult to name. And then again, having ascertained the cause, it is more difficult to relieve or prevent. In fact, as was stated at the last meeting of the New England Association of Gas Engineers, by Mr. M. S. Greenough, of Boston, Mass., who, in speaking* of the stoppage of burners, said he had, as a remedy, substituted one enriching material for another, thinking the first had been the cause of the stoppage, but "the substitution did not seem to have any effect on the burner difficulty," and "that the trouble afterwards disappeared—for the same unexplained reason that a great many other things happen;" or, as we might infer, things did happen for which we failed many times to get a reason.

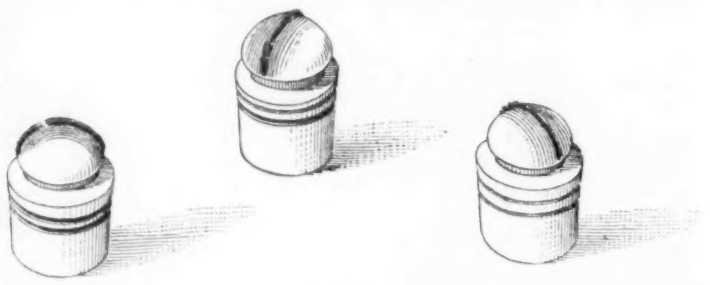
Having had quite a number of complaints of the stoppage of burners during the past two winters, and knowing at the same time that an excess of ammonia was being passed over, also noticing, as a general rule, the complaints came mostly from persons using clay, or more commonly termed, lava tips, and that very seldom did we hear anything from persons using iron or metal tips, the first thought which occurred to me was that a combination of the ammonia with the copper of the fixtures, forming the blue dust found in them, which being carried by the gas to the clay tip was decomposed, the ammonia liberated, and the copper deposited as cupric oxide—black oxide of copper—which is prepared by heating fragments of copper to low redness on a piece of earthenware. I should have said the complaints were mostly about burners used as night lights—that is, those burning at half-head or less, thus producing the low temperature which is conducive to the formation of cupric oxide from copper. The deposit when examined under the glass was composed of spars (large and small) of one general prismatic form, but failed to give any trace of metal when submitted to an analysis, thus proving the ammonia-copper combination theory false. The deposit proved to be carbon, not of a soft soot nature, but quite firm and hard.

The question then arose, "What produced the carbon in this form and at *that* particular point?" Knowing that during the winter months we were compelled to send our gas through the purifiers too quickly to allow the proper time for the chemical combinations and decompositions to take place, and that the bisulphide of carbon impurity did pass over, and also learning that this compound could be decomposed from gas by being passed over clay heated to between 400° and 600° of temperature, the sulphur combining with hydrogen to form sulphuretted hydrogen, and the carbon deposited on the clay, and this being so much like in nature to the cause which would probably lead to our trouble, we thought it advisable to experiment in that direction in the following manner:

First, to pass the gas through several solutions of the acetate of lead, to make sure of the removal of all the sulphide of hydrogen possible; then through a glass tube partially filled with pellets of dried clay—the tube in the meantime to be heated at a low temperature; finally, the gas was passed through a single solution of the lead, to see if the decomposition and recombination did take place, with the following result:

Gas which, previous to its entrance to the tube was entirely free from sulphide of hydrogen, did afterward contain a quantity sufficient, in very short time, to completely saturate the solution, thus proving that sulphur was separated. We also found that a burner consuming the gas previous to the elimination of the bisulphide, or that which was not passed through the tube, did, in a very short time, show a strong evidence of the carbon deposit; whilst another burner, of the same make and size, consuming the decomposed gas gave no sign at all of stoppage.

As stated before, the complaints came mostly from persons using the low or night lights. On those burners the crystals were deposited, on either side of the slot, on the tip in a fringe-like mass, as per the sample we have here for your inspection. The explanation of this, we would



think to be that, the light being down low, the requisite temperature of the clay tip for the decomposition of the bisulphide was not reached until the gas was just passing from the opening, and then the deposit was made on the outside. We did have some complaint from burners that were expected to be burned at a full head, but think the bisulphide theory will hold good, and can be accounted for in this manner.

When the lights are burning full the necessary temperature to decompose the gas is raised further down, or inside the tip, and there the carbon crystals are formed and deposited—then may be broken or detached and carried on by the flow of gas to the slot. Being very small, should they enter the slot lengthwise they pass on and are consumed in the flame; but on the other hand, should they strike crosswise they are apt to remain, causing a division in the jet of light, and finally, by their increase in number, require the use of a burner cleaner, or a complete stoppage of the gas is the result.

We have here, then, not only a cause for the stoppage of the burners, but a reason for the sulphur fumes that are complained of at times. The carbon of the bisulphide being deposited, the sulphur unites with hydrogen to pass through or from the burners as the sulphide of hydrogen.

Looking at the matter in this light, is it not probable that many of us do not appreciate the importance of the bisulphide of carbon as an impurity; and should we not be better prepared for its elimination? To be sure, we expect the ammonia in the washers, as sulphide of ammonium, or the lime in purifiers, as the sulphide of calcium, to perform this duty; but as these do often fail, and as a precaution, then, would it not be well for us in some manner to take out or decompose the bisulphide before the gas enters the lime or oxide of iron purifiers, giving them only the sulphide of hydrogen to deal with? As a suggestion, let the gas be passed through an iron retort filled with a loose clay material, heated to about 500° temperature by utilizing the waste heat from the furnaces. This should be done after all the tar has been extracted, otherwise the clay material would soon be choked. It may be possible that the watery vapors would be decomposed; but would this be a disadvantage? Is it not likely, in this case, there would be a recombination of the hydrogen with carbon and sulphur dropped as free sulphur? or possibly a monoxide of carbon would form, which, while not a light producer of itself, might be useful as a heat producer, and thus have a tendency to increase the illuminating power of the gas?

This paper was not discussed. On motion of Mr. Alexander, a vote of thanks was tendered to Mr. Printz.

*See JOURNAL, March 2, p. 442.

Mr. Irvin Butterworth, of Columbus, read a paper entitled—

A REGENERATIVE FURNACE ADAPTED TO A SMALL WORKS.

It has occurred to me that many managers of small works would be glad to convert their old-style furnaces into furnaces built on the regenerative plan if they were aware that it can be easily and profitably done. The furnace of which I shall attempt a brief description is one which replaced an old-style furnace, and is now in operation at Columbus. It is, therefore, adapted to a larger as well as to a small works, and I have designated it as being adapted to a small works simply because it does not require a retort house with a cellar, but which can be easily introduced into any gas works, however small, with comparatively little expenditure of time or money, and with an increase of 100 per cent. in efficiency over the old style of direct firing furnace.

It does require, however, a shallow pit in the retort house floor in front of the bench, about 2 feet deep, and extending back 6 feet from the furnace, wide enough for a man to work in, and covered with heavy sheet iron doors, so hinged as to be easily opened and thrown back for entrance into the pit, for the purpose of clinkering the furnace and cleaning out the ashpan.

It also requires a deep excavation for the furnace setting—say, to a depth of 3 feet below the retort house floor, in order that the furnace itself may have room for the deep bed of hot coke, and the space about it for the intermingling and combustion of the gases.

The walls that support the arches should be built of firebrick to the very bottom as an attempt at Columbus to utilize the old common brick walls that had served as foundations for the arches, resulted very disastrously.

The furnace settings must, of course, be provided with the secondary air flues essential to the regenerative principle: and, unless the waste heats are passed under the ashpan, there must be a pipe for supplying steam under the grate bars.

The furnace itself will be 5 ft. 3 in. long, and about 3 ft. 3 in. deep—that is, from the top of the grate bars to the secondary air ports; or, it will be 5 feet deep from the bottom of the retorts to the bottom of the ashpan, and will be 20 in. wide in the middle, and 12 in. at the top and bottom. An open space of 7½ in. between the ashpan and grate bars is provided for access into the ashpan for the purpose of cleaning it out, and it also admits air for draught and primary combustion. An excess of air is prevented from entering so large an opening by the sheet iron doors that cover the pit, which are made to fit so closely in their places as to partially exclude the air. The openings for the admission of air for secondary combustion are placed at about the height of the grate bars, and are, therefore, below the iron doors that constitute the floor in front of the bench. This position renders the slides that regulate the quantity of air admitted least liable to be accidentally moved in taking care of the coke that is drawn from the retorts. The air for secondary combustion is made to pass backward and forward in the setting through 2-inch pipes, laid one above the other about 5 inches apart, and extending to the very bottom of the setting. It then passes into a reservoir or "equalizing chamber," 9 in by 21 in., and 18 in. deep, built immediately back of the furnace, into which it is next conducted through the necessary flues and ports.

The products of combustion, after descending through the openings near the front of the furnace between the bottom retort and the arch, fill the large waste heat chambers at the sides of the furnace, and find an exit through a flue in the rear of the setting.

The furnace is charged with coke drawn directly from the top retorts into the furnace by means of a movable chute, through a round door, 12 in. in diameter, situated between, and a little above, the center of the two bottom retorts.

It will be seen that this furnace is simply a modification of the regenerative furnace in use in works whose retort houses were provided with cellars; but since it is difficult of description, and needs some further illustration than is possible within the limits of this paper, I have constructed a sort of model of the furnace out of wooden blocks ("out of my own head," as a certain amateur carpenter is said to have boasted, "and have wood enough left for another!") so made that it can be taken apart and its construction examined. I hope the members who are interested will examine this model and ask any questions about the furnace that it does not answer. I have also here a diagram of the front wall of the furnace.

With this furnace we have readily carbonized 300 pounds of Youghiogheny coal to the retort every four hours, the retorts being 14 × 22, and 9 ft. long. The old-style furnace which this replaced would, under favorable conditions, carbonize 200 pounds.

This furnace, as I have endeavored to describe it, is simple in its construction and easily managed. It does almost double the work of an old-style furnace; and, as I have said, can be readily and economically substituted for it in any gas works, however small.

But our best results at Columbus are derived from a furnace built precisely like the one I have described, with the addition that the products of combustion are made to pass under the ashpan and through an underground flue to a high smoke-stack. The model will show how the setting is constructed for passing the waste heats under the ashpan. To do this a deeper excavation for the setting is, of course, necessary. A small stream of water is kept constantly trickling into the ashpan, and the waste heats, passing under it, produce sufficient evaporation to furnish steam for the generation of CO, and for softening the clinker, although a steam pipe is also provided for use in case of necessity. By actual measurement, each of these furnaces was found to evaporate 602.7 pounds of water daily, or one pound for every 3.8 pounds of coke drawn into the furnace.

With this furnace we have thoroughly carbonized 1,900 pounds in six retorts, 14 in. × 22 in., and 9 ft. long, every four hours; and it has maintained sufficient heat to do this on much less than one-fourth of the coke produced. Indeed, we had considerable trouble to keep our heats from getting too high.

I may add, in conclusion, as a matter of interest, that, before reaching the smoke-stack, our waste heats are made to pass through a boiler, and by that means help maintain steam for the use of the works.

Discussion.

Mr. Hamlin—I have been greatly interested in that paper. We have been trying for some time to see if we could not improve the settings of our furnaces. The only improvement made thus far was by going down about 2½ feet further than we had gone, and utilizing that additional depth for coke, thus increasing the capacity of our fires. We intend to put in a new bench this year, and what we want to do is to put in the best one we can get. From the description Mr. Butterworth gives of this Columbus bench, I think that is what we want, provided we can get that bench in on 2½ feet below the floor.

The President—That is a plenty.

Mr. Hamlin—What would be the additional cost of that bench over a bench set in the old style, without disturbing the floor.

Mr. Butterworth—I cannot answer Mr. Hamlin's question, for the benches were built prior to my arrival at Columbus, and so I cannot speak as to their cost.

The President—I will answer the question. The tearing out and putting in the first time would probably add an additional cost, for labor and material, of $150. After that there would be no additional expense to replace it.

Mr. Hamlin—Did you have your own retort setter to do it?

The President—Yes.

Mr. Hamlin—Are his services open to the public?

The President—No, sir; we have two, however, and we can lend you one of them. We sometimes lend one. I think that the owners of any works would be justified in going to the expense of remodeling their furnaces. I would expect, from the plan carried out by Mr. Hamlin of heaping his coke, without making any provision for the secondary combustion, that, all other things being equal, and there being no more care taken in firing, he would simply increase the quantity of coke used, without increasing his heat. Possibly he might burn more coke and get less heat. In other words, with your higher heat you burn, directly, the carbonic oxide, and get as good results as could be got from that quantity of coke burned in that way. It was burning the coke entirely up—burning the gases, gasifying them as highly as can be done; but if you deepen your floor, and make no provision for the secondary combustion, then the carbonic oxide formed at the bottom of the furnace is dissociated, and as no secondary air is admitted above the coke, it would escape unconsumed, so that you would really get less heat out of the same quantity of coke.

Mr. Hamlin—There are two advantages which we thought we derived from the plan. One was that we thought we got better results—we were able to keep our heats up better; the other was that we did not have to fire up so often.

Mr. Butterworth—It strikes me that it would not cost a great deal more in time or money to arrange the secondary air flues. After he had once lowered the furnace it would be a very much easier matter to construct the secondary air flues.

The President—If you have already gone about 2½ feet below the ordinary depth you can put in your secondary air flues and make that furnace with an additional cost of $10. That is, when you come to reset your retorts again.

Mr. Bierce—Can this furnace be placed on an old setting, or is it necessary to make a new setting for it?

The President—It cannot be placed on old settings. It can be placed on old arches, but not on old setttings.

On motion of Mr. Padan a vote of thanks was tendered to Mr. Butterworth for his paper.

The Association then adjourned to reassemble on Thursday, March 17, at 9 A.M.

SECOND DAY—MORNING SESSION.

The Association met at the hour appointed. Mr. T. A. Bates, of Circleville, read the following paper on

CONDENSATION AND THE ELIMINATION OF TAR.

The subject of the paper assigned me by the Executive Committee is of such importance, and capable of developing such knowledge of chemistry and the subtle components of gas in its various stages, that they should have chosen one better qualified than I to handle it; but, in obedience to orders, I will cheerfully add my mite of information.

The distillation of bituminous coal in retorts heated to an intensity of 2,100° to 2,600° F. produces dense vapor or smoke, varying in color from very dark slate to dark yellow, according to the period of its distillation. This dense, offensive and unsightly vapor becomes, after the process of condensing, scrubbing, washing, and purifying, the invisible (but, unconsumed, still offensive) gas of commerce, which has long since ceased to be a luxury, being now one of the most necessary, at the same time least appreciated, articles of manufacture.

The first process to which crude gas is subjected is termed "condensation"—the general acceptation of the term being a reduction of its temperature so as to facilitate the deposition of the useless and objectionable matters held in suspension by the gas at this stage, and which would prove detrimental, not only to the further process of purification but leave the evil effect of their presence on all the appliances required to carry the gas to the point of combustion. Now, while it is true that condensation is a great aid to purification, I think the assertion, "That, if thorough, it is half of the purification," is too broad and should be modified. The components of crude gas as it leaves the retorts, and as we should deliver it to our consumers, are either known to you all or are obtainable in any work on the "Chemistry of Coal Gas." With a knowledge of these before us, it does not require much chemical information to prove that *too rapid condensation* will rob the gas of constituents it should retain. While we are all fully alive to the dangers of too rapid condensation, I am not aware of the existence of any table setting forth the temperatures to be observed at the various stages in the passage of gas from retort to purifier. If such exists I have failed to see it. That one could be formulated, the arbitrary observance of which would meet the strict requirement of *all sizes* of works, I very much doubt. It is very evident to my mind, however, that such a rule would be of great benefit to many of our profession; and some of our more scientific brethren should give us one.

A brief notice of the methods adopted for the accomplishment of the necessary condensation of gas may now be in order. As a preliminary, we find in some works a continuation of the take-off pipe from the hydraulic main to as great an extent as possible, giving a *very slight* inclination to the run, the object being to keep the gas as long as possible in contact with the tarry matter so rapidly deposited after leaving the hydraulic main, thus enabling the gas to *take up* some of the hydrocarbons contained in the tar over which the gas passes. I have never been able to convince myself that this resulted in much good; the tar necessarily occupies but little space in the total area of the pipe, so the gas cannot be in contact with it, merely passing over. If rich hydrocarbons *are already precipitated*, and form part of the tarry compound, there seems to me to be nothing in the flow of this gas along the bottom of the pipe (always cooler than the tar) that will so volatilize these compounds as to cause them to rise and mingle again with the passing gas. The result aimed at in the adoption of this method could, I think, be better accomplished by *not allowing these very essential elements to leave the gas;* and as the rapid cooling of the gas on leaving the hydraulic main is the cause of much of this deposit, would it not be better to interpose a vessel near the hydraulic, having as much internal surface as possible, consistent with free working? The temperature in such vessel can be kept such as to preclude the throwing down of the lighter oils, and allowing such chemical changes to take place that shall *fix* a portion, at least, in the gas; while the contact of the gas with the material chosen to obstruct the flow, and give additional surface, will break up the minute globules that, in a film of tar, contain rich illuminants. These, being released, will be taken up by the passing gas, to its marked enrichment.

If the make of gas were such as to pass the gas from the hydraulic main to this vessel, at a temperature of 150° to 170° F., very good; if not, a steam coil could be introduced that would enable you to regulate the temperature. I would not stint this vessel in size, it being desirable to have the gas pass as slowly as possible through the material composing the filling. I am aware that the above-mentioned temperature is much below the boiling point of all but one of the substances contained in gas tar, many of which are valuable illuminants. We have such eminent authority as "Bowditch" for the statement, "That gas will carry forward to point of combustion hydrocarbon vapors whose boiling point is *far above* the temperature of the gas." I will say, *en passant*, that on one occasion the addition of a vessel of this character before (and in addition to) a stand of plain pipe condensers added to the illuminating power of the gas made, 1 to 1.5 candles.

Of condensers proper, we have several forms. The pipe condenser, formed of pipes placed vertically, and suitably connected to allow the passage of gas through each, the gas being cooled by radiation. This style is old, inefficient, and nearly obsolete. Atmospheric condensers are of various forms, usually large annular pipes placed vertically, and connected by diagonal pipes, the gas passing through each annular successively. A condenser of this description is decidedly better than one formed of pipe alone, giving us the benefit of the cooling surface of the outer diameter, as well as that of the inner or air opening. The gas being also passed in a thin stratum, is much more efficiently cooled than in plain pipe condensers. This form of condenser is not, however, received with much favor in this country. My experience some years ago with one built of *wrought iron* gave me excellent results. In general style it was patterned after the Kirkham—cast iron base and diagonal pipes. The twelve annulars were built of No. 12 B.G. iron, were 14 ft. high, 18 in. outer diameter, 12 in. diameter air opening. With a daily make approximating 200,000 cubic feet, this condenser was all that could be desired.

The best feature of such a condenser, to my mind, is the gradual lowering of the temperature of the gas. This *may* mean a larger outlay of money, and a little more room for greater condensing surface; but I am of the opinion that, *should* such be true, the results obtained by use of the atmospheric condenser would offset any such expense.

Let us briefly notice the multitubular. This consists of a series of pipes, usually vertical, in size and number suited to the duty they have to perform, and properly connected at bottom and top. A cast iron casing incloses them, and the water with which it is filled can be regulated in temperature by means of in and outflow. From the very general adoption of this style of condenser in works making from 200,000 cubic feet, and upward, daily, they must possess the merit of "filling the bill."

I have seen the Pelouze and Audouin condenser at work in several works, and have heard it highly spoken of by those using it. Mr. R. B. Taber, of New Bedford, Mass., in his remarks* before the last meeting of the American Association, speaks highly of its efficiency; and I do not doubt but that it would prove a valuable addition to any gas plant.

We have also the Smith & Farmer, the Livesey, and others, whose construction and properties you are all no doubt familiar with. But let them be called "ziz-zag," "sinuous," "friction," or what-not; let the material with which they are filled be iron plates, wooden slats, bricks, boulders, or anything else, the object to be obtained is the same, viz., to increase the internal surface of the apparatus, subdivide the gas, and prolong, as far as possible, its contact with surface, wet and dripping with tarry matter rich in illuminants.

The condensation of gas begins on its evolution from the retort, and is not *complete* before reaching the purifiers—not always then—so that all apparatus, from hydraulic main to purifiers must be considered as taking a part in the process of condensation. The arrangement would be as follows: A vessel of suitable shape and ample size, well filled with slats, division plates, or anything to give great surface, and insure free passage of gas, and kept at a temperature of 150° to 170° F.; next, a Pelouze and Audouin condenser; then pass to an atmospheric condenser; following this a Livesey scrubber and washer, all suited in size to the requirements of your works. With careful attention, then, to the manipulation of these, avoiding, above all things, *too rapid change in the temperature* of your gas, you will be able to deliver the gas to the purifiers in excellent condition to be acted upon by the material used for purifying, and in candle power all that could be desired.

Thus far nothing has been said as to "elimination of tar;" and I think as little remains to be said. My experience has been that if gas is subjected to the above described treatment you will have pretty effectually eliminated all tar from the gas by the time it reaches the purifiers.

*See JOURNAL, Nov. 16, 1886, p. 992.

Discussion.

[Secretary Butterworth here exhibited and explained a diagram showing the plan adopted at the Columbus gas works for the condensation and elimination of tar.]

A Member—Is that plan of condensation based on the Livesey principle—a series of boards standing on edge?

Secy. Butterworth—That is the plan of arrangement; but whether it is on that particular principle or not I cannot say.

A Member—We have found that plan very practicable, and have received very great benefit from it.

A Member—Is it presumed that the gas in its course through the washer and scrubber absorbs any moisture from the water?

Secy. Butterworth—I do not take it that it does.

Mr. Carroll—We have had some experience at Steubenville with this tar subject. We had very great difficulty in keeping tar out of our purifiers, and at the outset I used an apparatus somewhat similar in arrangement to that shown by the Secretary, but was not successful with it. I then dug a tunnel, and carried a line of pipe some 70 feet back from the washer or scrubber, returning it the same distance. That succeeded in doing away with the tar trouble in our purifiers, but the practice seemed to favor somewhat the formation of naphthaline deposits in the apparatus. These deposits, however, were so slight that we still work under the method outlined, and get along very well.

Mr. Canby—We have had no trouble at Bellefontaine in taking the tar out of our gas for some three years. We have had a Pelouze and Audouin condenser in use for three or four years, and before its employment we had considerable trouble with the tar in the bottom of our purifiers; but since the condenser was added our purifiers have been as dry as we could wish them to be. This condenser seems to break up all the globules of tar floating from the hydraulic main. I think the use of that machine will overcome the tar trouble. Its results have been very satisfactory with us.

Mr. Dittmar—Three years ago we overhauled our Troy works, and then put in a steam jet exhauster, which was set, I would judge, about from 40 to 50 feet from the hydraulic main. The gas next passes through a scrubber, then it enters an annular condenser, and passes on to and through a washer. There the trouble commences. From there into the seal heavy naphthaline deposits accumulate. About twice a week I have to clean out the pipes. I have tried everything imaginable to avoid it, but without success. I would like to know if anyone can suggest a plan by which I can get rid of that naphthaline? My only remedy now is to have a man clean it out twice a week.

The President—You want the naphthaline eliminated instead of the tar?

Mr. Dittmar—That is it.

Secy. Butterworth—I would like to ask Mr. Dittmar if he knows how much cooler the gas is on leaving the washer than it was before it entered it? Has he made any test of the temperature of the gas after and before the washer?

Mr. Dittmar—No, I have not.

Mr. Carroll—I think I shall have to explain that in the course of the improvements made at our works we placed one of our condensers at the end of the hydraulic main, and from that the gas passed through the 70 feet of pipe to our exhauster. Having passed the exhauster it enters the multitubular condenser, and from the multitubular it passes on to the scrubber. The pipe extension spoken of was made from the multitubular condenser out into the arch, for the purpose of extending the washer. There is where we caught the principal part of the tar—in front and rear. We found that the spray we had did not amount to anything; but after we improved the spray we took every particle of tar out, and also found less development of naphthaline. We have never been troubled much with naphthaline. I find that there is a very great variation in the amount of trouble caused by stoppages, from one cause or another, in the pipes of a gas works, which difference is, in part at least, traceable to the sort of coal carbonized.

Mr. Wood—We have never been bothered with stopped stand-pipes in the retort house, or around the works. I cannot say anything on the subject, never having been bothered in that way—although I do not know why we should be free from the difficulties that beset others.

The President—Is your system of condensation and scrubbing different from that of others?

Mr. Wood—No; it seems to be practically the same. We run out through the tar extractor first, then through the friction condenser, and then through the scrubber. We use a fine spray, and have no trouble at all.

The President—Mr. Walker has had considerable experience and opportunity for observation. Perhaps he can tell us something about it.

Mr. Walker—I do not know that I can say anything of interest on the subject, although I travel around the country considerably. I have seen such a variety of condensers and apparatus for eliminating tar and naphthaline in its various forms, that it is pretty hard for me to tell which one to describe. The fact is that every man in the gas business has his own ideas with regard to his mode of running a works. The results accomplished in different works are dependent almost entirely upon local circumstances; and what will apply to one works will, in very few cases, apply to another. Condensation is performed in a great many ways by condensers of the plain atmospheric form, as well as by the annular multitubular sorts. Were I operating a gas works on my own account I would be in position to speak to you of the plans which had my preference, but not being directly connected with a works I cannot speak from present practical experience. Some years ago, in works with which I was then connected, we used multitubular condensers, and found them to work satisfactorily, although we found, in some instances, that the cooling was effected too quickly. We altered that after a time, and then our condensers worked better. We also put in what we call a hot scrubber, for the elimination of naphthaline, which was very successful in its operation. We operated that for a little over a year. I do not think any plant in the country was ever more cursed with naphthaline than the one with which I was then connected. We started with the hot scrubber, as we called it, in the winter, when the temperature ranged from about zero to 15° or 20° below. Before we commenced to use this hot scrubber we were carbonizing about 10 per cent. of cannel to keep our gas up to about seventeen candles. Then we had naphthaline all over—in fact so much of it that we had to shut down the works. We had it in every piece of apparatus throughout the works—in the station meters, purifiers, the condensers and scrubbers. We had to stop and clean it out. Then we started this hot scrubber—or, rather, it was a hot scrubber so constructed that heat could be applied outside the scrubber to raise the temperature of the gas after it left the hydraulic main. The scrubber was arranged so as to break the gas up very fine—that is, to break up all the small globules which are held in suspension, We found, after running that for about ten days, that our candle power—still keeping up the same amount of cannel—was increasing. We did not wish to give our consumers too good a gas, so we cut down the cannel. After running 15 or 20 days we found that we were keeping the quality fully up to the required candle power, and were using less than three per cent. of cannel to attain that end. Having thoroughly cleaned the pipes and then started the plan heretofore mentioned, we were no longer troubled by naphthaline deposits. We worked at as high heats as anybody else did at that time—ten years ago—and got a good yield out of our coal; the average yield per pound, I think, was about 4.90. However, what would apply in that respect in those works might not answer in all others; but in some it would no doubt prove satisfactory. We formed the opinion that that method of working was most efficacious, not for the destruction of naphthaline, but to enable us to utilize it in enriching the quality of our gas.

Mr. Bierce—What method did you follow in cleaning out your apparatus when the same was clogged with naphthaline?

Mr. Walker—Our method, I might say, was accidentally developed; but, accidental or not, it was most complete. We experimented with wood gas. If there is anything under heaven that will thoroughly clean out the clogged pipes of an old gas works, let the stoppages be from naphthaline, tar or any other conglomeration, it is to treat them to a dose of wood gas. It is about as good an emetic as can be given to any gas works.

Mr. Bierce—I have had somewhat the same experience in a works that I have just undertaken to manage. Being a little ambitious, and desirous to get more gas out of coal than they had been in the habit of getting, the pipes became choked up with naphthaline. The difficulty began just after the gas issued from the exhauster; and to remedy it I introduced jets of steam, which melted it. At a point between the purifier outlets and the inlets to the holders I found that an injection of gasoline of high specific gravity gave relief. It evaporates the naphthaline and carries it on forward, but I have not yet found whether or not it is likely to reappear further on—say in the street mains, etc.

Mr. Ross—My experience has been somewhat similar to that reported by Mr. Dittmar. In fact, my trouble, like his, dated from the introduction of a jet exhauster. The entire works seemed to be choked up with naphthaline crystals—the center-seal, purifiers, etc. I experimented, and the result is that I now rely on steam to melt it out, and run it off to the drips.

Mr. Carroll—It is usual, as I understand, to run those multitubular condensers filled with water; but we have never used water in ours. I think that probably we keep our pipes measurably free from naphthaline simply by reason of the degree of heat that we carry through them.

Mr. Canby—I am a firm believer in hot scrubbing. Since I have used hot scrubbers I have had no such trouble with naphthaline as I had before. In fact, for the last two years I do not think I have had any crystals of naphthaline to bother me at all. Before I adopted hot scrubbing the case was very different.

On motion of Mr. Padan, a vote of thanks was tendered to Mr. Bates.

(To be concluded.)

Is Lofty Guide Framing Necessary for Large Gasholders?

The London *Journal* thus calmly discusses a rather revolutionary idea in the principles and practice involved in the construction of "lofty gasholders," but we cannot forbear from expressing the thought that our contemporary's commenter does not feel that inward ease in regard to the matter discussed which usually accompanies a dissertation written by one who thoroughly believes in the stability of the thesis advanced. However, this is what our contemporary says on the subject:

The question as to what is the precise value of gasholder framing is one that has been raised several times by engineers with a propensity for diving after abstract principles of construction, but has not yet been settled, or even placed upon the road that may lead to settlement. There have been suggestions for center-pillar holders, and for concentric holders which should hold each other up; but the only practical experiment to test the principles of gasholder framing which has yet been carried out upon the theory that the old-established notions concerning the stability of these structures was erroneous, is the well-known three-lift holder at the Old Kent Road works, which served as a model for the holders at Windsor Street, Birmingham. During the coming summer, however, another step will be taken in the same direction, as a gasholder at the Rotherhithe works of the South Metropolitan Company will be enlarged by the addition of a third lift, *without raising the guide-framing to the additional height*. This new departure in gasholder design is the logical development by Mr. George Livesey of the leading ideas expressed in his Kent Road holder, and still more strongly exemplified in the four-lift holder now being erected by Messrs. Ashmore, Benson, Pease & Co., Limited, at East Greenwich. The spectacle of a gasholder rising a whole lift above its guides, with its useless top carriages feeling abroad, as it were, for support and finding none, will, to say the least of it, be an odd one. It will be eminently a sight to startle one's ideas out of routine conceptions of the principles of gasholder guiding; and this is probably one of the reasons why Mr. Livesey determined upon the experiment. The saving by dispensing with the framing for the additional lift will not in this instance be great. But behind it lies the whole problem of the utility and office of guide-framing in general; and this is large enough. In view of this somewhat startling novelty—which, by the way, may be commended to the careful study of those highly-trained Continental engineers whose mathematical minds have not yet led them to approve of the idea of ordinary double-lift holders—it may not be out of place here to consider briefly the most obvious problems in connection with the stability of gasholders in general.

First, then, what is the object of the exterior framework of a gasholder? It is primarily to provide a means of guiding the movable vessel along its vertical path. In this aspect it is a railway set on end, up and down which the cylindrical tank of gas moves slowly, and is maintained in place while resting. The first conditions of such an arrangement are rigidity and truth of line. Both ends of the line of railway must be as steady as they can possibly be made. In most holders the steadiness of the lower or tank end is readily assured, because the bedding of the "permanent way" is unyielding masonry. It is usually sought to provide for the rigidity of the other end of the track, which is in the air at a greater or less distance from the source of origin—the ground—by laying it along heavy columns or along cantilevers firmly stayed in their places and tied to the ground by strong diagonal rods. Now, it is evident that, in order to be of any service at all, this guiding structure must not only be rigid, but must preserve its rigidity under the greatest stress that can be brought upon it. This is the essence of the theory of guiding a gasholder by an independent exterior framing. The theory is that the holder itself is utterly unable to stand unless held up by a rigid set of supports, strong enough to endure all the strain of the unstable bulk which they inclose, under the influence of any imaginable storm and tempest. It may be a little startling to those constructors who hold this view, but it is nevertheless true that, according to this theory, every gasholder in England ought to be a wreck before the week is out. *It is impossible to construct a framework strong enough to uphold a gasholder of any considerable size, without depending upon the inherent stability of the holder itself*. In other words, there is in the construction of gasholders a point, depending entirely upon their bulk, beyond which these structures are wholly independent of the exterior framing with which it is at present thought necessary to provide them. If this were not true, the erection in the open air of holders surpassing 40 or 50 feet in diameter, and 30 to 40 feet high, would have been impossible. As soon as this limit had been passed, every gale would have swept the land clear of gasholders, and the larger ones would all have been inclosed in storm-proof buildings.

The truth as it applies to gasholders is in strict analogy to the conditions of a State and of individual life. (This is not advanced as a proof of the contention, but only in illustration of it.) When the gasholder is small, light, and comparable to a balloon, it must and can be guided and kept in its proper place by external means of control; just as when a State is inchoate, or an individual young, the ruler and the tutor can exercise a nesessary training and repressive power. There comes a stage, however, in the development of gasholders, as of men and of nations, when external guidance is impossible, and the structure, like the organism, must stand or fall by its own intrinsic quality of stability or the lack thereof. Analogies, as already observed, are not proofs; but they enable one to indicate succinctly the meaning which it is intended to convey. What we mean in the present argument is that for large gasholders lofty exterior framing, as at present constructed, might and in time will be dispensed with.

It is necessary, however, to enlarge a little upon the grounds for this doctrine, which may be easily misinterpreted. It is admitted that gasholders must rise truly and easily; but the point now under discussion is whether the usual exterior framing has anything to do with the fulfilment of this function by holders of large size. In face of all tradition and established usage, we believe that this framing is a superfluous survival, in the case of large gasholders, of an appurtenance which is only necessary for those small holders from which the larger ones have been developed by gradual enlargements; and that any engineer, if he were called upon to construct gasholders of the class and dimensions now common, without reference, conscious or unconscious, to the practice of the builders of small holders, could effect his object without any exterior framing standing more than a very few feet above the level of the water in the tank, or at most to the height of the inner lift.

The considerations upon which this opinion rests are few in number, and capable of easy verification. In the first place, let us take the example of any large holder framed, according to the old-fashioned way, with heavy columns and tiers of horizontal girders. Regard these columns as cantilevers with a weight applied at the top, or free end, at the highest point where the top carriage roller of the upper lift of the holder touches the guide-rail, and calculate the weight that with this leverage would break the holding-down bolts or crush the compression side of the column. It is a mere computation of the effect in a lever of the first kind of a pressure applied in a the ordinary way; and the immediate result of such a calculation will be to show that very little weight can ever have come upon the extreme top end of the lever. In a column 100 feet high every ton of side pressure at the top becomes 100 tons on a fulcrum 1 foot from the point of resistance to overturning at the ground line, where the strength and rigidity must be provided, if at all. The only good effect of all devices of columns, girders, diagonal ties, and the rest of the usual elaborate guiding structure, is to transmit the strain to the ground as directly as possible. There is no strength in the members up in the air. All they are good for is to preserve a rigidity of form, and to send their burdens down to earth without getting forced out of shape in so doing.

Now comes the great question: Why employ elaborate and costly independent framing to transmit to earth the sideways pressures of a gasholder, when you have the holder itself to do it? In every large holder extant stability has proceeded from two factors—dead weight and tight bottom rollers. Without these no outside framing that was ever erected could save a holder from wreck by the first sou'-wester; with them, the outer guiding structure becomes of very minor importance. With regard to the effect of dead weight, we know that the extreme wind pressures occasionally registered by anemometers are illusory; and we have every reason to believe that no gasholder in the United Kingdom was ever subjected to a wind pressure of 20 lbs. per square foot. Taking this figure, however, for the sake of safety, we will assume the case of a three-lift holder 150 feet in diameter and 100 feet high, which is rather an extreme proportion of height to base. A gasholder is supposed, being cylindrical, to expose (say) two-thirds as much area as a vertical plane to the direct effect of the wind; so that in a gale of the presumed force the holder would receive a horizontal push of 200,000 lbs., and even this would not be constant. To resist this, if the holder gave a pressure of 40-10ths, there would be a dead weight of 368,200 lbs. Place a block weighing 368 lbs. on a smooth, level plain, and hang to it a weight of

200 lbs. by a line passing over the edge of the plane through a pulley—how much force would the former exert against an upright designed to maintain it in position? Next, with regard to the bottom rollers, it is a striking fact that no gasholder was ever yet known to fall over unless the bottom curb rose above the edge of the tank, or the bottom rollers became in some way displaced. This is simply because in the holder, as in the outer framing, the only stay and holdfast is in the ground; and the holder must transmit its strains to the ground, which it can only do through its bottom rollers. Every puff of wind tends to press inward the side sheets against the outward stress of the confined gas; and these pressures and counter pressures would rock the holder if it were free to move. But all this is checked by the bottom rollers. Here, then, at its base, not at the top, is the place whence the stability of a gasholder must be provided for, if at all. With a strong bottom curb—a horizontal web-girder of steel, if the structure is large enough to need it—and strong, well-adjusted bottom rollers in a double tier a few feet apart vertically, the largest holder might be built in perfect security, and never feel the want of that elaborate above-ground guiding structure which costs so much money, gives so much trouble, and takes such a long time to build, and, unless very well adjusted to the rollers, does infinitely more harm than good.

Standard Pipe and Pipe Threads.

A recent issue of the *Stevens' Indicator* (a technical publication connected with the Stevens' Institute, Hoboken, N. J.), in discussing the above subject, says:

The chaotic state in which the matter of standard pipe threads has been for years, both here and abroad, has finally had the effect of arousing American engineers at least to vigorous action. As a result the whole subject has been thoroughly overhauled by a committee appointed somewhat over a year ago by the American Society of Mechanical Engineers, in conjunction with committees of United States manufacturers of wrought iron and boiler tubes, and brass and cast iron fittings. The outcome of their work was embodied in an exceedingly interesting report submitted to the American Society of Mechanical Engineers at their last annual meeting (November 29th—December 3d, 1886), and which has just been issued in pamphlet form.

Without going into all the details which it was desirable to give in this report, it will suffice for our purpose to note that after an endless amount of correspondence, a large number of committee meetings, and the examination and test of many samples of threaded pipe, the several associations of manufacturers resolved to adopt and adhere to the original Briggs standard of gauges. Comprehensive information regarding the subject of standard pipe and pipe threads as applied in American practice is given in the Excerpt Minutes of "Proceedings" of the British Institution of Civil Engineers (session 1882–83, Part I.), containing the paper of the late Robert Briggs on American Practice in Warming Buildings by Steam. Referring specially, however, to the matter here considered, we take from the report before us the following, from the text and tables of Mr. Briggs's paper, giving completely the data upon which the Briggs standard pipe thread sizes are based:

The taper employed for the conical tube-ends is uniform with all makers of tubes or fittings—namely, an inclination of 1 in 32 to the axis. Custom has established also a peculiar length of screwed end for each different diameter of tube. Tubes of the several diameters are kept in stock by manufacturers and merchants, and form the basis of a regular trade in the apparatus for warming by steam. The ruling dimension in wrought iron tube work is the external diameter of certain nominal sizes which are designated roughly according to their internal diameter. These nominal sizes were mainly established in the English tube trade between 1820 and 1840, and certain pitches of screw thread were then adopted for them, the coarseness of the pitch varying roughly with the diameter, but in an arbitrary way utterly devoid of regularity. The length of the screwed portion on the tube end varies with the external diameter of the tube according to an arbitrary rule-of-thumb; whence results for each size of tube a certain minimum thickness of metal at the outer extremity of the tapering screwed tube end. It is the determination of this minimum thickness of metal for the tapering screwed end of wrought iron tube which constitutes the question of mechanical interest.

For a tapering tube end for a nominal 2½-in. tube—that is, a tube of about 2½ in. internal diameter and 2⅞ in. actual external diameter—the following particulars are given: The thread employed has an angle of 60°; it is slightly rounded off both at the top and at the bottom, so that the height or depth of the thread, instead of being exactly equal to the pitch, is only four-fifths of the pitch, or equal to

$(0.8)\frac{1}{n}$, if n be the number of threads per inch.

For the length of tube end throughout which the screw thread continues perfect, the empirical formula used is—

$$(0.8\ D \times 4.8) \times \frac{1}{n}$$

where D is the actual external diameter of the tube throughout its parallel length, and is expressed in inches. Further back, beyond the perfect threads, come two having the same taper at the bottom, but imperfect at the top. The remaining imperfect portion of the screw thread furthest back from the extremity of the tube is not essential in any way to this system of joint, and its imperfection is simply incidental to the process of cutting the thread at a single operation. From the foregoing it follows that, at the very extremity of the tube, the bottom of the diameter of the thread is—

$$D \times \left[\frac{2 \times (0.8\ D \times 4.8)}{32n} + \frac{2 \times 0.8}{n}\right] = D - (0.05\ D + 1.9) \times \frac{1}{n}$$

The thickness of iron below the bottom of the thread, at the tube extremity, is empirically taken to be $= 0.0175\ D + 0.025$. Hence the actual internal diameter d of any tube is found to be, in inches—

$$d = D - (0.05\ D + 1.9) \times \frac{1}{n} - 2 \times (0.0175\ D + 0.025)$$

or—

$$d = 0.965\ D - 0.05\frac{D}{n} - \frac{1.9}{n} - 0.05$$

For the various sizes of tubes ranging from ⅛ in. to 10 in. internal diameter, with their corresponding numbers of screw threads per inch, the actual internal diameter of d is expressed by the following Table I. in terms of the actual external diameter D.

TABLE I.—*Diameters of Wrought Iron Welded Tubes.*

Nominal Internal Diameter of Tube. Inches.	No. of Screw Threads per Inch. No.	Actual Internal Diameter d in Terms of Actual External Diameter D. Inches.
⅛.....	27	$d = 0.9631\ D - 0.1204$
¼ and ⅜.....	18	$d = 0.9622\ D - 0.1556$
½ and ¾.....	14	$d = 0.9614\ D - 0.1887$
1, 1¼, 1½, and 2	11½	$d = 0.9607\ D - 0.2152$
2½ to 10.....	8	$d = 0.9587\ D - 0.2875$

The figures derived from this statement, which are of importance for practical use, are presented in detail in Table II. in a convenient order for reference.

The number of screw threads per inch for the several sizes of tubes is here accepted from customary usage. It is the workman's approximation of the pitch practically desired, and much reluctance must consequently be felt in calling it into question. Still it would have been better to investigate the general case upon the basis of a pitch ranging in closer accordance with the range of tube diameter. Thus the nominal ⅛-in. tubes might have had 16 threads per inch; ¾-in., 14 threads; 1 and 1¼-in., 12 threads; 1½ and 2-in., 11 threads; 2½ to 3½-in., 10 threads; 4 to 6-in., 8 threads; 7 to 9-in., 7 threads; and 10-in., not more than 6 threads per inch. The existing number of threads, however, as given in Tables I. and II., are now too well established to be disturbed; at all events they must be taken in any statement of present practice.

TABLE II.—*Standard Dimensions of Wrought Iron Welded Tubes.*

Diameter of Tube.				Screwed Ends.	
Nominal Inside. Inches.	Actual Inside. Inches.	Actual Outside. Inches.	Thickness of Metal. Inches.	No. Threads per Inch. No.	Length of Perfect Screw. Inches.
⅛	0.270	0.405	0.068	27	0.19
¼	0.364	0.540	0.088	18	0.29
⅜	0.494	0.675	0.091	18	0.30
½	0.623	0.840	0.109	14	0.39
¾	0.824	1.050	0.113	14	0.40
1	1.048	1.315	0.134	11½	0.51
1¼	1.380	1.660	0.140	11½	0.54
1½	1.610	1.900	0.145	11½	0.55
2	2.067	2.375	0.154	11½	0.58
2½	2.468	2.875	0.204	8	0.89
3	3.067	3.500	0.217	8	0.95
3½	3.548	4.000	0.226	8	1.00
4	4.026	4.500	0.237	8	1.05
4½	4.508	5.000	0.246	8	1.10
5	5.045	5.563	0.259	8	1.16
6	6.065	6.625	0.280	8	1.26
7	7.023	7.625	0.391	8	1.36
8	8.982	8.625	0.322	8	1.46
9	9.000	9.688	0.344	8	1.57
10	10.019	10.750	0.336	8	1.68

Taper of conical tube ends, 1 in 32 to axis of tube.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, April 9, 1887.

Oil Gas in England.—New Way of Utilizing Coke.—Paris Gas.—The Status of Gas Engineers.—Honesty is the Best Policy.—Novel Views Respecting Gasholder Guide Framing.—Pushing the use of Gas Cooking Stoves.

There seems to be good reason for believing that coal will not continue to be the sole material for gas manufacture in this country, as it has been in the past. Some 50 years ago oil was tried, and undertakings were established with the object of supplying oil gas, but it was soon found that the oil was too expensive, and that they must either liquidate or take to coal; so, wherever it was practicable, the latter course was adopted, and the title "oil gas" dropped out of use. Since that time oil has been used to a very limited extent for the production of oil gas for railway carriage lighting, and a few other purposes in which gas of 50 or 60 candle power was a desideratum; but it has altogether been thrown on one side by gas companies in the ordinary way. The supply of cheap petroleum, paraffine and shale oil is now once more directing attention to the gas producing capabilities of hydrocarbon fluids. A company has been formed at Glasgow for the purpose of working a system of making gas from paraffine, and they are about to give their system a practical trial at Linsburg, a small town of some 500 inhabitants, requiring, perhaps, one million cubic feet of gas per annum. The gas is said to be of about 60 candle power, and it will be interesting to know how much of this is actually obtained in the consumer's house. Mr. G. Bower, the well-known gas engineer and contractor, of St. Neots, in a letter addressed to the *Journal of Gas Lighting*, points out that it is now 25 years since he commenced to supply sets of oil apparatus for India and other parts of the world, where the cost of coal was such as to prohibit its use. This apparatus was capable, he says, of producing 25,000 cubic feet of 50-candle gas per ton of oil used. If the gas was considered too rich the only suitable diluent was weak carburetted hydrogen—that is, coal gas of poor quality—as, if carbonic oxide, hydrogen or air were used, the result would be a less total illuminating power per ton of oil than if the gas was used in an undiluted state. The only impurity to be removed was a little carbonic acid, and the gas would mix readily with weaker gases.

In the same communication Mr. Bower has a suggestion to make about coke, for adoption in districts where coke suitable for foundry or locomotive purposes is costly. This is that the breeze and coke be pulverized and mixed with about one-fourth its weight of coal tar pitch. This mixture is to be coked in an ordinary coke oven, and Mr. Bower anticipates that the product will be suitable both for the foundry and the locomotive. In many districts foundry coke will realize three times the price paid for good gas coke, so that, if this operation proves successful in practice, it will add materially to the revenues of gas undertakings. The idea also possesses the specially attractive feature that breeze and screenings, which in many districts are almost valueless, could also be included and treated in this way. Various endeavors have been made in the direction of the manufacture of a good quality foundry coke, in the course of the destructive distillation of coal for the production of illuminating gas, but they have mostly aimed at special treatment of the coal in large or specially shaped retorts. The advantages of a process that admits the coal being heated in any way desired, for the production of the best possible results in the shape of illuminating gas, in bringing in any screenings or breeze that has not been through a furnace, and of utilizing the principal product from coal tar, are too obvious to need further comment.

The municipality of Paris do not let the local gas company alone for any length of time, nor is it to be expected that, so long as the present arrangement by which a high price to the consumer is guaranteed, whatever else may happen, is allowed to continue, the representatives of the public will be able to retain their seats without keeping up some sort of a show of opposition. The municipality are in an awkward position in this matter, because they accept a large share of the gas company's profits, according to the agreement, and are therefore very much in the position of the receiver of a bribe; or we may liken them to a gas engineer who, having betrayed his trust by accepting a large commission from a contractor, is called upon by his directors to object to the goods supplied. Lately they have decided that the existing methods of testing gas for illuminating value, for sulphuretted hydrogen by means of lead paper, etc., are insufficient, and that in the future the gas is to be analyzed, with a view of detecting the presence of any objectionable ingredient, such as carbonic oxide, ammonia, or other substance that is poisonous, likely to produce unwholesome fumes, or to affect the value of the gas. The results of such tests are likely to be of interest and value to the profession, if properly and accurately conducted, but it is difficult to see how they will be of any practical use in the face of existing agreements. This new move is interesting in view of the fact that a certain small clique in England have occasionally agitated for the valuation of coal gas by analysis. Most experiments in this direction, however, go to prove that all known methods of gas analysis fail to yield concordant results, so far as the actual illuminating value is concerned, whilst the existing tests are quite sufficient on the score of purity.

I have refrained from referring to the matter known as the "Salford gas scandal" until the public excitement attending the matter has passed over, as so many strange rumors and assertions found their way into print about it as to render the separation of the true from the false a matter of some difficulty. It appears that Mr. Hunter, the gas engineer to the Corporation of Salford, an important suburb of Manchester, brought an action for libel against a coal contractor, Mr. Ellis Lever, the said libel consisting of the assertion that Mr. Hunter was guilty of bribery and corruption, being in the habit of accepting bribes from parties supplying goods for the gas works. Placed on his defense, Mr. Lever proved to the satisfaction of the court that these assertions were substantially true, and the case was consequently dismissed. Mr. Hunter was, of course, virtually condemned, and was summarily dismissed from office. In every class of life there are persons who overstep the limits of the law, therefore the existence of one such in the ranks of the 8,000 gas managers in the United Kingdom (whilst all agree in deploring it) would not be a matter of general interest but for the extraordinary attitude that some sections of the public press have taken towards it. They have accepted the extraordinary exposures at Salford as an indication of the usual customs in the gas engineering profession, and the newspapers and magazines of the day abound with expressions to the effect that gas engineers, as a body, expect "tips," that the principal object of gas engineers associations is to decide upon the firms from whom the heaviest bribes can be extracted, and that it is impossible for firms depending entirely upon the supply of gas works necessaries to get an *honest* living. Applying this absurd method of reasoning, there is not a single respectable trade or profession in the country. Bankers are swindlers, ministers of religion are licentious hypocrites, stockholders are knaves, and lawyers are no better, shopkeepers are cheats and adulterators, and so on. It is also singular to notice that the giver of the bribe is entirely exonerated by these touters, who are willing to cast mud at innocent people so long as they tickle the public fancy. They draw the absurd and impossible portrait of a gas engineer all but advertising for "who will give the highest bribe." No one, however unscrupulous, would be so reckless as to follow this course. The more reasonable supposition is that the delicate fact that a "tip" is obtainable is carefully and subtilely put out by the giver. With all this vaporizing the fact remains that the majority of gas engineers deservedly enjoy the confidences of their directors, having no transactions with contractors or suppliers of goods that are of a secret or underhand nature. Nor is this ignorant maliciousness likely to do them permanent harm. I do not hold up gas engineers as a pattern of commercial morality to the rest of the world, but I do claim that, as persons chosen to fill a responsible office, and intrusted with large interests, personally selected with due care and inquiry as to character, the instances in which any abuse of the confidence placed in them exists are very few and far between.

Gas engineers, apart from conscientious considerations, are well aware that "honesty is the best policy," and a certain Mr. Alfred Simmonds, a master gas fitter of Berkhamstead, who evidently was not trammeled with any scruples of this kind, has received a practical proof of the truth of this proverb. Mr. Simmonds, fully aware from the nature of his calling inherent to the use of coal gas, inclosed his gas meter in a box, with the ostensible object of "preventing the children from tampering with it." But the innocent looking box also served to cover a bye-pass pipe, affording a direct supply from the service pipe without passing through the meter. This was discovered by the gas officials before any considerable quantity of gas could be thus surreptitiously obtained, and the cautious gas fitter was promptly summoned to explain his conduct before the magistrates. As the upshot of this interview Mr. Simmonds was called upon to hand over the sum of $100; so his lesson in honesty was rather costly.

An article* which recently appeared in the *Journal of Gas Lighting* is devoted to the discussion of the necessity for guide framing in connection with large gasholders. The subject is viewed from a novel standpoint. The general impression in the profession is that a strong framework is necessary to retain the holder in its place, and to resist the overthrowing action of wind. So it has always been the rule not only to continue the framework up to the highest point reached by the holder

* See page 284.

carriages, but to take special care that it should be thoroughly rigid and strong. Heavy cast iron columns were considered an important adjunct at first, but latterly these have given way to a cheaper way of effecting the same result, viz., diagonal bracing and tie rods, so arranged as to convert the whole frame into a rigid ring or cylinder. According to the view now advanced all this is just so much labor wasted. It is stated that the inherent stability of the holder itself is sufficient to resist any wind stress yet experienced in this country, and that the purpose served by the frame is simply that of a guide, and that the real source of strength and resistance is not the guide framing, but the bottom of the curb of the holder. In proof of this it is pointed out that no holder has yet been known to be overturned unless the bottom curb was first tilted out of place and lodged on the edge of the tank at one part. So it is claimed that, with a strong bottom curb, and well adjusted bottom rollers in a double tier, a few feet apart vertically, a holder would be quite safe with no framing above the tank other than that necessary to receive the upper tier of bottom rollers when the holder was nearly full. Mr. George Livesey is about to test this idea by adding an additional lift to a holder at the Rotherhithe station of the South Metropolitan Gas Company without making any alteration or addition to the guide framing.

A very good way of attracting attention to the use of gas cooking stoves consists in arranging for the delivery of a course of lectures on cookery and domestic economy, illustrated with practical demonstrations carried out by means of gas stoves. If a thoroughly qualified lady lecturess is secured, and the thing properly advertised, a good attendance of ladies throughout the course will result. A few stoves, of the kind supplied by the gas company can be exhibited in the room, and one or more officials from the gas works should be in attendance to take orders, explain the stoves, etc. A good opportunity is afforded for a few remarks on the general subject of gas supply, and these may be introduced by the manager, or one of the directors, either at the commencement or close of any lecture. Objects of interest, models, diagrams, etc., may also be exhibited in the room. It is better to make a small charge for admission rather than to issue free tickets to the consumers. Such a plan may be thoroughly carried out at a cost of not more than $50 to the gas company, and it answers most efficiently as a taking advertisement. Such, at least, is the experience in several towns in this country where it has been tried.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The Columbus (Ohio) Gas Company Proclaims the Dollar Rate.—Some time ago in the not very dim past either one of our sages ventured the assertion that the Star of Empire was likely to "wend its way" in the direction of the West; and the sage, judging from the progress achieved in the development of the West, which judgment must needs guide the horsoscoper not entitled to lay claim to sage-like wisdom, evidently knew whereof he spoke. However, gas men, as a rule, are more interested in the "Star's" influence upon their business than in other departments, and we accordingly submit the fact that the "star of cheap gas" is in zenith over Columbus, Ohio—latitude 33° 57′ N., longitude, 82° 59′ W. The simple facts in the case are that from and after May first the residents of the capital city of the Buckeye State will obtain their gas at the rate of $1 per thousand cubic feet—coal illuminating gas, too; while the gas furnished to the street lamps will be billed to the city fathers at the rate of 75 cents per thousand—it seems rather strange to be obliged to use the word "cents" in announcing a gas rate, especially when the suppliers of the article in question are but members of a corporate business enterprise liable at any (or all) time to receive the flattering assurance that they are bloodless and soulless monopolists. Of course, it would be a hard job to discover anything possessed of a soul that did not, at one period or another, have more or less blood in circulation; but as the "indignant public" seldom pauses for words wherewith to score its enemies, why, "there's an end o' it." Perhaps one Columbus man may feel sad at the prospect of being cut off from his customary growling at the gas suppliers—that sorrower, of course, being Dr. Robinson; but, on second thought, possibly the Doctor may—if Machiavellian, he will—"point with pride" to the fruition of his efforts for the public good. All hail to the Columbus triumvirate of gas men who performed this great deed—Messrs. Huntington, Robinson (A. B., not the Doctor), and McMillin.

Cheaper Gas for Boston, Mass.—The Boston (Mass.) *Transcript* is our authority for the following: "On the 1st of April the Boston Gas Light Company reduced its price for gas from $1.50 per thousand cubic feet, to $1.40. When the Company began business, in 1828, the price of gas was $5 per thousand. The rate gradually fell until the war period, when it rose again, and, on January 1st, 1865, was $3.25. Five years later it was reduced to $3; on April 1st, 1871, the price was $2.75; July 1st, 1872, it was lowered to $2.50; April 1st, 1876, to $2.25; April 1st, 1879, to $2; Jan. 1st, 1883, to $1.80; July 1st, 1884, to $1.50, at which price it has remained until the present time."

Annual Election, American Meter Company.—At a meeting of the Trustees of the American Meter Company, held at the offices of the Company, 512 West 22d street, this city, on April 19th, the following board of officers was chosen: Geo. J. McGourkey, President; William H. McFadden, Vice-President and Assistant Superintendent, at Philadelphia; Wm. N. Milsted, Treasurer and General Superintendent; Wm. H. Down, Secretary and Assistant Superintendent at New York; Paul S. Merrifield, Assistant Treasurer at New York; and Wm. H. Hopper, Assistant Treasurer at Philadelphia. The Trustees were re-elected. It will be noted from the above list that Mr. T. C. Hopper is succeeded in the Presidency by Mr. McGourkey, formerly Vice-President, and that Mr. McFadden was chosen to fill the vacancy created by Mr. McGourkey's promotion. The retiring President declined a re-election on the ground that he had long desired to seek that immunity from the worriments and cares of active business which his extended and faithful work in the Company's service fairly entitled him to. While loth to accede to the request, his associates finally acquiesced, and Mr. Hopper will now have opportunity to call some portion of his time his own. Before taking leave of this subject we cannot refrain from remarking that the business enterprise which resulted from the union, years ago, of the meter establishments of Down & Merrifield and Code, Hopper & Co., is exceptionally fortunate in the *personnel* of those who carry on the burden of the work. In the new President, Mr. McGourkey, the Company enjoys the services of a man of rare executive ability, and of wonderful financial accumen; in fact no other man is better known, nor enjoys a more brilliant reputation, in the banking circles of New York city, than the newly elected President of the American Meter Company. Regretting the fact that Mr. Hopper *would* resign, we can congratulate him upon the caliber of the man who replaces him at the helm, and the Company upon the felicity of its choice.

An Item from Far-Away Fargo.—Fargo (Dakota Ter.) has been supplied with gas for quite a while by a thoroughly live, go-ahead Company, and its promoters have received a fair reward for their enterprise and pluck. Indeed, the original promoters of the Fargo Gas Light and Coke Company were looked upon as having undertaken a rather dangerous contract, but their subsequent success is the best evidence that they knew what they were about. From a letter recently received by us from Mr. L. Gray, Sec. and Supt. of the Company, we take the liberty of extracting the following: "We have obtained a charter for the town of Moorhead, Minn.—just across the Red River from Fargo—which place contains about 3,000 inhabitants, and expect to extend our mains over there this summer. We have also bought out the plant, etc., of the defunct Fargo Brush Electric Light Company, and are now engaged in moving the same to our gas works. Adjoining the latter we have built a brick structure, 32 feet by 38 feet, to contain the dynamos and engine, and have obtained a city contract under which we will light the streets by means of three towers, each to be equipped with six arc lights, to run all night and every night, for the sum of $360 per month. The contract is to last for three years. Business here is better than for four years back, and is growing still better every day."

Public Lighting at Troy, N. Y.—At an adjourned meeting of the Troy Contracting Board, held April 16th, it was decided to award the contracts for public lighting in accordance with the following: Troy and Citizens Gas Light Companies to furnish gas to street lamps equipped with three-foot burners at the rate of ten cents per lamp per night; where four-foot burners are in use the charge to be eleven cents per night; both Companies to furnish gas to public buildings at the rate of $1.75 per thousand cubic feet. The arc lighting portion of contract was given out at 47 cents per light per night, although the electricians contended strenuously for an advance to 50 cents. In fact, as we understand it, the "light-of-the-future" men originally bid 50 cents, but the Contracting Board would not agree to the proposition. Troy's electrical promoters, it is said, are not enjoying a bonanza.

A Siemens-Lungren Company for New York City.—Albany advices state that on April 15th a certificate incorporating the Siemens-Lungren Gas Lamp Company, of New York city, was filed with the Secretary of State. The Company is capitalized in $100,000.

New Gas Company.—Col. C. K. Holliday, of Topeka, Kansas, has secured a contract to build a gas and electric light plant at Arkansas

City, Kansas. Arkansas City was, in 1880, a post village of Cowley county, with a population of less than 2,000; now it is a full fledged city, claiming to have a population of but little less than 10,000, and fairly bubbles over with activity. It boasts of an iron foundry, machine shops, rolling mills, and a $75,000 hotel. It is located on the Arkansas River, about 14 miles south of Winfield, and is about four miles distant from the boundary line of Indian Territory.

PROPOSING TO START AN OPPOSITION GAS COMPANY.—We learn that, on or about April 12th, Messrs. W. J. Knight, A. Kamman, F. O'Donnell, M. M. Ham, M. M. Walker, and E. T. Kein met for the purpose of organizing an opposition or competing gas company in Dubuque, Iowa. Having discussed the features of the situation, the agitators finally decided to go ahead, and organized by selecting or electing the following board of officers: President, F. O'Donnell; Vice-President, M. M. Walker; Secretary, E. T. Kein; Treasurer, A. Kamman. The capital was fixed at $160,000, and it is proposed to charge $1.75 per thousand cubic feet—when ready to supply gas. The Council will be appealed to for the necessary franchise, etc. Mr. Ham, one of the gentlemen who hopes to lubricate his financial future by means of this venture, is reported to have explained, "That it is the purpose of the Company to associate with them a large Eastern Company, with great experience, which will have charge of the business, while the Dubuque stockholders keep the majority of the stock, consequently the control of the organization. Two companies in the East have been looking over the ground, and one of them will undoubtedly come. If the home Company secures liberal rights from the city the richer of the two will take hold and put in an excellent system in Dubuque. If the rights granted by the city are not so liberal the richer company will not take hold of the matter, and it will be left for the other." It is pretty hard to weigh out exactly what Mr. Ham means to convey in the above, save in respect to the fact that, cut up his words as you will, Mr. Ham seems indisposed to cast any of his own fat in the fire—no matter what the proprietors of the "rich" or "lean" Eastern Companies conclude to do with the Dubuque gas range. In the meantime it is more than likely that Brother Howard, of the old Key City Gas Company, will try harder than ever to convince his Board of Directors that they, by reducing the gas rate, could "cure" Mr. Ham and his Eastern coadjutors of any desire to intermeddle in the gas supply of that city.

IMPROVEMENTS AT MONTCLAIR, N. J.—The proprietors of the Montclair Gas Company who have the franchise for supplying gas in Montclair and Bloomfield, have begun the excavation for a gasholder tank in ground on Bloomfield avenue, just east of the railroad crossing. They also propose to replace the present six-inch gas mains, between the works (at Bloomfield) and the town of Montclair, with a ten-inch system.

ANNUAL ELECTION, ROME, N. Y.—At the annual meeting of the stockholders of the Rome Gas Light Company the following board of directors was chosen: Messrs. G. N. Bissell, F. H. Thomas, J. D. Higgins, W. R. Huntington, T. H. Striker, H. G. Utley and N. F. Thomas. Mr. G. N. Bissell was subsequently chosen President.

HOW IT IS DONE AT BROOKLINE, MASS.—The Brookline Gas Company supplies the Suburban Electric Light Company, of same town, with coke and coke screenings for fuel. The latter Company will put in two tubular boilers fitted with the Jarvis boiler setting to economically burn the class of fuel used. The coke is thoroughly wetted before it is fired, and the gas distilled from the combustion of the wet fuel is utilized by the aid of the hot air discharged over the fire through the ducts of the Jarvis furnace.

TONAWANDA APPRECIATES THE SITUATION—but the voters would have it so; although a wail comes from them at present because of the Egyptian darkness that prevails in the South Village after sunset. The voters of Tonawanda, N. Y., at a recent election, voted down the proposed appropriation for street lighting, because they thought such action would force the Gas Company to offer a lower bid, and for the further reason that, when such lower bid was received, another election could be held to accept it. This is the way a local newsman now views the scene: "A law was subsequently discovered which made a second election illegal. It was then thought that a sufficient surplus of last year's appropriation would help things out, but at the latest meeting of the Village Council it was found that the street lighting fund had been overdrawn $700, which left but one alternative. The Council ordered that the lamps be not lighted, and the order is now (mid-April) in full force. Intense gloom prevails everywhere, when the day is done, and the pedestrians go stumbling along on the uneven sidewalks. The better portion of the population is indignant, and added to their wrath is a fear of a serious kind. The fund for the maintenance of the police is out, too, and property is at the mercy of thieves, who can best conduct their operations under the cloak of darkness. Never was the village in such a state before, for, even when there were no lamps, a public officer exercised guard over the sleeping inhabitants. What will be done no one knows. There is a great deal of talk, but all tendency to act is wanting. One and only one way is open, and that is to obtain a special act of the Legislature for the holding of an election to approve appropriations." With the present condition of affairs to act as a spur to the memories of Tonawanda's voters, it is likely that hereafter the South Village voter will ponder ere he deposits the silent token of his sovereign will, etc.

A GAS WORKS AT AUCTION.—Under a decision of the Court of Chancery the works of the Columbus (Miss.) Gas Light Company will, on date of May 16th, be disposed of at public sale, by Messrs. E. Gross and G. A. Evans, Commissioners in Chancery. There ought to be some lively bidding on this property, for the town is most eligibly located, and it would seem as if it had quite a future before it. Columbus is on the east bank of the Tombigbee river, is about 150 miles northeast of Jackson, and 98 miles northeast of Meridian. It is easily accessible by rail from other sections of the country, and the Tombigbee furnishes a waterway for fair-sized steamships. It is noted as a shipping point for cotton. Population about 7,500.

CHEAPER GAS FOR ATHENS, OHIO.—We are indebted to Mr. C. H. Welch, Secy. and Supt. of the Athens Gas Light Company, for the information that on and after first instant the Company will supply gas to consumers, using 500 cubic feet and upwards, at the rate of $2.00 per thousand. In cases where the monthly consumption is less than the specified minimum quantity the former charge ($2.50) will prevail. During the discussion, at the recent meeting of the Ohio Association, on the papers read by Messrs. Converse and Prichard, Mr. Welch said, among other things, "Although our works at Athens are very small, we nevertheless endeavor in every way to increase the consumption;" and we submit that the latest action taken by his Company is proof positive in support of his Dayton assertion. The Ohio idea at present seems to be in the direction of cutting gas rates, so general is the movement in that regard in the Buckeye State. Stronger may it grow.

FOLLOWING IN HIS FATHER'S FOOTSTEPS.—At a meeting of the directors of the Jacksonville (Ills.) Gas Company, held April 18th, Mr. E. J. King was formally elected to the position of Superintendent. Mr. King succeeds his late father, Mr. J. O. King, an account of whose demise will be found in our editorial pages of the current issue.

A METER ON EXHIBITION.—The average newspaper reader is often treated by his favorite "reflector of public opinion" to a tirade on the untruthfulness of the gas meter; but it must be confessed that the meter does not seem to mind the volume of criticism meted to it, calmly keeping on in the even tenor of its way. Further, meters are usually relegated to the seclusion of a cellar, and are often found in motley company, but even those dispiriting conditions fail, as a rule, to disturb their equilibrium. However, we now have an opportunity to mention one particularly lucky sample of the genus meter, that was "pretty" enough to have been placed on exhibition, and to get its "name in the papers;" therefore, availing ourselves of the chance, partly to "right a wrong," we extract the following from a recent issue of the Hartford (Conn.) *Times:* "The Hartford Gas Company has received and placed on exhibition, in the front window of the Main street office, a large meter which is to be used in the new building of Brown, Thomson & Co. It is a handsomely ornamented affair, and the manufacturers (D. McDonald & Co., of Albany) say it is the finest meter, out of the 101,931 they have made, which has left their shops. It will supply gas to six or seven hundred burners. Messrs. Brown, Thomson & Co. will light all the rooms in their building with gas, and will rent the rooms, gas bills paid."

CHARTERED.—The Overbrook Light and Power Company, of Overbrook, Pa., was chartered on April 19th. Capital, $30,000.

JARVIS STEAM PLANT FOR THE BURLINGTON (VT.) GAS COMPANY.—The Jarvis Engineering Company, of Boston, Mass., has received a contract under which they will erect a complete steam plant for the Burlington Gas Company. The contractors will fit a tubular boiler on the Jarvis plan of boiler setting, to permit the use of coke screenings for fuel; will supply two Armington & Sims' Company's engines; also will erect one of their new style of chimneys, which, it is said, will cost one-third less than chimneys constructed on the old plan. In fact the Jarvis

folks claim that the new style chimneys cost about the same as iron stacks.

CONSOLIDATED AT BRATTLEBORO, VT.—We are informed that the owners of the Mechanics Gas Company have sold their plant to the old Brattleboro Gas Light Company, receiving therefor something like $12,000. The latter Company will, as soon as possible, consolidate the plants, and furnish the entire gas supply of the city from the works on the depot grounds. The works of the Mechanics Company, which were formerly owned by the Estey Organ Company, will be closed, and the large factory buildings of the Organ Company are to be lighted by gas from the old Brattleboro plant. A pledge has been made that this consolidation shall not increase gas rates, which is now supplied at the rate of $2.70 per thousand cubic feet, less ten per cent. for prompt payment.

THE COST OF IT.—A genius of a reporter, who is a member of the staff of the Chicago *Tribune*, has been figuring out what it cost to manfacture each 1,000 cubic feet of gas made by Supt. Green, of the Ohio Penitentiary gas works, during last March. He got the thing down pretty fine—that is, we mean the reporter did, and if he can do anything like as well, if ever he comes East, in this section of the country, we will guarantee him his pick out of at least 100 gas works, whose proprietors will gladly pay him $25,000 per annum, and present him occasionally with a $10,000 check. The *Tribune* man figures out the net cost of Ohio Penitentiary gas to have been 15½ cents per thousand cubic feet, on a total make of 3.7 millions. For instance, he gives figures to prove that 3.7 millions cubic feet of gas were purified at a gross cost for material of $5.26. Then, to show how firmly disposed he was to enter up every item connected with net cost, he charges up "interest on plant, at the rate of 5 per cent. per annum." Come East, young man; your presence here will fill an "aching void." But, come to think of it, how could Chicago spare him? For an itemized statement of the Chicago expert's opinion, see Chicago *Tribune*, April 23d.

HASTINGS' GAS RATE.—We understand that the residents of Hastings-on-the-Hudson (N. Y.) are being supplied with gas, at the rate of $2 per thousand cubic feet.

VENTURA (CAL.) HAS GAS.—The Ventura Gas Company, of San Buenaventura, sent out gas to the residents on the night of April 4th. The Company starts out with 140 meters. This town is the capital of Ventura county, Cal., is located on the Pacific Ocean, at a point 60 odd miles west-by-north of Los Angeles, and is likely to assume importance as a business center.

ELECTRIC LIGHT FOR BISMARCK CITY, DAKOTA TER.—The City Council of Bismarck have granted to Messrs. L. W. Thompson and C. R. Gilman an exclusive privilege, to last for ten years, for the supply of electric lighting in that city. They have also been authorized to put up 12 arc lights (1,200-candle power) on account of the public lighting, and the price at which the service is to be performed was adjusted at 50 cents per arc per night. Sixteen-candle power incandescent lights are to be furnished in the public buildings at a charge not to exceed $3 each per month. The contractors will supply the Thomson-Houston system.

COKE IS WORTH SOMETHING IN THE LONE STAR STATE.—Mr. O. L. Musgrave, Supt. of the San Antonio (Texas) Gas Light Company, is on an Eastern visit, partly for pleasure, but chiefly for the purpose of inquiring into anything new in the line of retort house benchwork. We understand that he has determined to put in two benches of nines on the Klonne and Bredel plan, and that the San "Antone" gas men ought to have done something of the kind at an earlier period will be understood from the fact that coke, in the retort house yard, readily commands 25 cents a bushel. Indian Territory coal is carbonized, which costs, placed in the Company's bins, $7.50 per ton. Tar is also valuable in that city, and we opine the local gas men are pretty firm believers in the value of coal gas. English cannel—it comes to Galveston in the shape of ballast in English bottoms—is used as an enricher. The annual sendout of the Company is pretty close on to twenty millions cubic feet, and the selling prices range between a maximum of $3.50 and a minimum of $2.80.

STREET LIGHTING AT NEWBURGH, N. Y.—At a recent meeting of the Newburgh Council the local gas suppliers were awarded a contract for the partial lighting of the city by gas, both as to the streets and public buildings, on the terms which prevailed last year. These were, street lamps, $35 each per annum; gas to public buildings, $2.50 per thousand.

MORIBUND.—The Gas Reform Association of this city did not long survive the demise of its originator—the late Mr. Sherwood—for some days ago Judge Donohue appointed Jacob Marks receiver of the property of the "reformers," the action being taken at the instance of J. J. Bradley, to whom the "reformers" were indebted in the sum of $4,827. Mr. Bradley got judgment for that amount, but that is about all he did get. These are the worthies who canted so glibly about the dishonesty of the managers of the Consolidated Gas Light Company; but it is just what one might expect—they prate about virtue, and fail to pay their bills.

SORRY TO KNOW THAT HE GOES SO FAR FROM US.—We have information to the effect that Mr. Edward G. Pratt, Secretary of the Guild of Gas Managers, and Supt. of the North Attleboro' (Mass.) Gas Light Company, at a special meeting of the directors, held April 22d, tendered his resignation, the same to take effect on May 15th. Mr. Pratt has been retained to take charge of the Des Moines (Iowa) Company's plant. Of course, this means more responsibility and a better salary, but we are sorry to think that his new berth will take him so far away from us. However, if North Attleboro' is sad, Des Moines, it may be said, does not share in the feeling. We wish him the best of good luck in his new field.

INCORPORATED.—The Chicago Arc Light and Power Company was incorporated on the 23d of April. It is capitalized in $1,000,000. Among the incorporators are Messrs. C. R. Cummings, Marshall Field, S. A. Kent, C. N. Fay and Jno. H. Barker.

COL. BENSON'S EUROPEAN STUDIES.—A correspondent who keeps a watchful eye over current happenings forwards the following: "Col. Fred. S. Benson, Engineer of the Nassau Gas Light Company, of Brooklyn, N. Y., made good use of the time devoted to his recent European trip. He visited five countries, and inspected a large number of gas works. Almost every hour of the daytime was thus employed, his traveling being mainly done at night. In fact the rapidity of his movements excited the admiration and wonder of the British and Continental gas managers, who are apt to punctuate their journeyings by longer and more frequent stops. With his usual good fortune he succeeded in securing as a traveling companion one of the most intelligent and influential members of the European fraternity, hence the Colonel was made as much at home in the French, German and Austrian works as when in England and Scotland. The fruit of his observations will not only be reaped by his Company, but, later on, the Society of Gas Lighting and the American Association will doubtless be edified by papers from his ready pen. Col. Benson made especial study of the various systems of regenerative and recuperative furnaces, and the result will be seen ere long in a model installation at the Nassau works. Among other approved apparatus in use extensively abroad, as well as in this country, of course, is the 'Standard' Washer-Scrubber, and one of these, with a daily capacity of one million cubic feet, has been ordered from the Smith & Sayre Manufacturing Company for erection in the Nassau works.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Public Lighting in Brooklyn, N. Y.

BOSTON, MASS., April 22, 1887.

To the Editor AMERICAN GAS LIGHT JOURNAL:

While in New York, a few days since, I saw a statement in one of the Brooklyn (N. Y.) newspapers relative to the cost of the electric light, and, not understanding the statement, I wrote to one of our friends there and obtained from him the following facts, which differ somewhat from the statement put forth by the author of the figures in the Brooklyn newspaper.

The present price received by the Brooklyn Gas Company is $19.80 per year per light, or the same price that this Company has been paid for the past four years. Four of the other companies receive $22 per year, and one company receives $21.75 per year.

The electric light was first introduced in Brooklyn, for street lighting, in June, 1885; and since that date 4,844 gas lights, which formerly cost the city $103,578.85, have been discontinued. To replace these gas lights 995 electric lights are used, which cost $181,582 per annum—showing an increase in cost of lighting of $77,903.15. Instead, therefore, of the false statement put forth before the Committee of the Legislature by interested parties, the truth seems to be that if all the gas lights in Brooklyn were to be displaced by electric lights, the cost would be increased over $233,000.

Verily, it does seem as though there are those engaged in electric lighting who are as good at fancy figures as some of those who seek to introduce the latest patent gas processes.

NAMSAG.

THE AMERICAN
GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

Editor—JOS. R. THOMAS, C.E.
Asst. Editor—T. J. CUNNINGHAM.
Manager—C. E. SANDERSON.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH
At No. 42 Pine Street, New York.

This is a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE.

TERMS

SUBSCRIPTION—Three Dollars per annum, in advance.

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MONDAY, MAY 2, 1887.

The Market for Gas Securities.

The market for city shares keeps dull and strong, although some animation has been developed in Consolidated dealings. However, there is nothing as yet in the line of regularity in the volume of business transacted, and brokers assert that until the Legislature adjourns the see-saw style is apt to prevail. Consolidated touched 86¾ a few days ago, but the greater number of sales took place at, or slightly below, 86. The Standard Company acts, of course, as a disturbing factor, nevertheless those especially interested in old city gas shares do not appear to regard the future influence of the newcomers on the gas supply of the metropolis as being particularly dangerous. The prophets are once more turning their attention to the probability of an increase in the rate of dividend on Consolidated stock, but the Irving Place magnates manage to conceal their intentions in that regard as carefully as ever. If the dividend is not increased next declaration day (and we think it unlikely), the Company ought to carry over a handsome surplus. Perhaps the safest way to deal with the Brooklyn situation would be to pass it silently for the present; but the figures there are well maintained. In out-of-town shares the feature was the advance in Baltimore securities, Consolidated having sold, on April 25, up to 76¾, or a gain of ten points over our last quotiaton. Our quotation for April 28 (time of writing) is 73¼. The cause of the rise is attributed to free buying for control by Mr. Garrett, who possesses a large interest (so it is said) in the Chesapeake Company. The latter stock also scored an advance of ten points. We are unable to give information in regard to the Chicago situation, but presume that matters there will speedily take shape. Private advices state that Laclede, of St. Louis, is bid for at 129. San Francisco shares are higher. In fact the out-of-town situation, as a rule, is all on the side of the holder.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

16 WALL ST., NEW YORK CITY.

MAY 2.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	85⅞	86⅛
Central	440,000	50	30	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	127	130
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	113
Mutual	3,500,000	100	100	101
" Bonds	1,500,000	1000	101	—
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	—	80
Richmond Co., S. I.	300,000	50	50	—
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	105	107
Citizens	1,200,000	20	56	58
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	135	—
" Bonds	300,000		—	106
Peoples	1,000,000	10	58	60
" Bonds	290,000	—	100	—
" "	250,000	—	100	—
Metropolitan	1,000,000	100	82	84
Nassau	1,000,000	25	104	106
" Ctfs	700,000	1000	100	—
Williamsburgh	1,000,000	50	130	—
" Bonds	1,000,000	—	111	—
Out of Town Gas Companies.				
Boston (Mass.) Gas Co.	2,500,000	500	910	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	140	145
" " Bonds	45,000	—	—	—
Chicago Gas Co., Ills	5,000,0000	25	142	145
Peoples G. L. & C. Co., Chicago, Ills	3,000,000		29	31
Cincinnati G. & C. Co.	6,000,000	100	184	185
Consolidated, Balt.	6,000,000	100	73¼	—
" Bonds	3,600,000		107	107½
Chesapeake, Balt.	1,500,000	100	89	90
"	1,000,000		100	102
Consumers Toronto	1,000,000	50	194½	196½
Central, S. F., Cal.			86	100
Capital, Sacramento, Cal.			56	58
Hartford, Conn	750,000	25	140	142
Jersey City	750,000	20	155	—
Laclede, St. Louis, Mo.	1,600,000	100	125	—
Louisville, Ky	2,570,000	50	130	132
Little Falls, N. Y.	50,000	100	95	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	209	215
New Haven, Conn		25	190	195
Oakland, Cal.			36½	—
Peoples, Jersey City		—	25	30
" " Bonds			—	—
Paterson, N. J.		25	90	—
Rochester, N. Y.		50	75	80
St. Louis, Missouri	600,000	50	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	61	62
Memphis (Tenn.) Gas	750,000	100	—	—
" Bonds.	240,000	100	103	—
Washington, D. C.	2,000,000	20	210	—
Wilmington, Del.		50	205	215
Havana (Cuba) Gas Co.	3,000,000	100	18	20
" Bonds	550,000		102	—

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City ... 300
Wm. Henry White, New York City ... 300
Wm. Farmer, New York City ... 300
William Gardner, Pittsburgh, Pa ... 300

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd, New York City ... 303
T. F. Rowland, Greenpoint, L. I ... 303
Delly & Fowler, Phila., Pa ... 308
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 302
Stacey Mfg. Co., Cincinnati, Ohio ... 303
Bartlett, Hayward & Co., Baltimore, Md ... 303
Morris, Tasker & Co., Limited, Phila., Pa ... 302
Davis & Farnum Mfg. Co., Waltham, Mass ... 292
R. D. Wood & Co., Phila., Pa ... 302
Southwark Foundry and Machine Co., Philadelphia, Pa ... 302
Bouton Foundry Co., Chicago, Ills ... 303

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills ... 293

GAS AND WATER PIPES.

Gloucester Iron Works, Phila., Pa ... 300
Meilert Foundry and Machine Co., Reading, Pa ... 00
Cincinnati and Newport Iron and Pipe Co., Newport, Ky ... 300
Ohio Pipe Co., Columbus, Ohio ... 300
Pancoast & Rogers, New York City ... 300
M. J. Drummond, New York City ... 300
Wells Rustless Iron Co., New York City ... 292

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa ... 276
Clerk Gas Engine Co, Phila., Pa. ... 292

RETORTS AND FIRE BRICK.

J. H. Gautier & Co., Jersey City, N. J ... 98
B. Kreischer & Sons, New York City ... 298
Adam Weber, New York City ... 298
Laclede Fire Brick Works, St. Louis, Mo ... 298
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y ... 298
Borgner & O'Brien, Phila., Pa ... 298
James Gardner, Jr., Pittsburgh, Pa ... 298
Henry Maurer & Son, New York city ... 298
Chicago Retort and Fire Brick Works, Chicago, Ills ... 298
Baltimore Retort and Fire Brick Co., Baltimore ... 298
Oakhill Gas Retort and Fire Brick Co., St. Louis, Mo ... 298
Evens & Howard, St. Louis, Mo ... 299
Cincinnati Gas Retort and Fire Brick Works, Cincinnati, O. 299
Emil Lenz, New York City ... 299

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City ... 301

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md ... 291
Fred. Bredel, New York City ... 291

GAS GOVERNORS.

T. C. Hopper, Phila., Pa ... 296

CEMENTS.

C. L. Gerould, Manchester, N. H ... 298

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio ... 304

GAS METERS.

Harris, Griffin & Co., Phila., Pa ... 306
American Meter Co., New York and Philadelphia ... 307
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa ... 307
Helme & McIlhenny, Phila., Pa ... 307
D. McDonald & Co. Albany, N. Y ... 307
Nathaniel Tufts, Boston, Mass ... 306

EXHAUSTERS.

P. H. & F. M. Roots, Connersville, Ind ... 294
Smith & Sayre Manufacturing Co., New York City ... 294
Wilbraham Bros., Philadelphia, Pa ... 294
Connelly & Co., New York City ... 295

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 305
Perkins & Co., New York City ... 304
Newburgh Orrel Coal Co., Baltimore Md ... 305
Despard Coal Co., Baltimore, Md ... 305
Chesapeake and Ohio R.R. Coal Agency, N. Y. City ... 305
Westmoreland Coal Company, Phila., Pa ... 305
Monongahela & Peters Creek Gas Coal Co., Pittsburgh, Pa ... 305

CANNEL COALS.

Perkins & Co., New York City ... 304
J. & W. Wood, New York City ... 304

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y ... 296
John McLean, New York City ... 296
Chapman Valve Manufacturing Co., Boston, Mass ... 296

ENGINES AND BOILERS.
Jarvis Engineering Co., Boston, Mass. ... 291

PURIFYING MATERIAL.
S. H. Douglas, Ann Arbor, Mich. ... 299

GAS LAMPS.
The Siemens-Lungren Co., Philadelphia, Pa. ... 301
G. Shepard Page, New York City. ... 300
Albo-Carbon Light Co., Newark, N. J. ... 293
Standard Gas Lamp Co., Phila., Pa. ... 299
Geo. H. Gregory, New York City. ... 299

PURIFIER SCREENS.
John Cabot, New York City ... 297
Geo. A. Mills, Baltimore, Md. ... 299

GAS STOVES.
American Meter Co., New York and Philadelphia. ... 297
The Goodwin Gas Stove and Meter Co., Phila. Pa. ... 308

STREET LAMPS.
J. G. Miner, Morrisania, New York City. ... 260
Bartlett Street Lamp Mf'g Co., New York City. ... 296

BURNERS.
G. Gefrorer, Phila., Pa. ... 304

STEAM BLOWER FOR BURNING BREESE.
H. E. Parson, New York City. ... 268

GASHOLDER TANKS.
W. C. Whyte, New York City. ... 292

GAS FIXTURES.
Mitchell, Vance & Co., New York City. ... 296

COKE CRUSHER.
C. M. Keller, Columbus, Ind. ... 305
B. J. Allen, Newark, New Jersey. ... 305

COAL HANDLING MACHINERY.
C. W. Hunt Company, New York City. ... 299

GAS BAGS.
Peerless Manuf'g Co., New York City. ... 299

BOOKS, ETC.
English Journal of Gas Lighting. ... 291
Gas as a Source of Light, Heat and Power. ... 296
Goodwin's Directory of Gas Light Companies. ... 304
The Chemist's Assistant. ... 300
King's Treatise. ... 306
Scientific Books. ... 306
Management of Small Gas Works. ... 300
Newbigging's Gas Manager's Handbook. ... 306
Gas vs. Electricity. ... 292

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Ten No. 2 Siemens Regenerative Gas Lamps,
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The SIEMENS-LUNGREN COMPANY hereby warns the public against the use of various infringing Regenerative Gas Lamps which are offered for sale. This Company has heretofore delayed bringing suit to enjoin the manufacture or importation of such infringing lamps, solely because of the practical worthlessness of the infringing devices; and although, in each instance, they infringe some one or more of the various patents owned or controlled by this Company, they have fallen into disuse sooner than any suit could be brought to a hearing. As, however, the introduction of these infringing lamps has tended to discredit the practicability of our Company's system of regenerative gas lighting, we have instructed our Attorneys, Messrs. Geo. Harding, C. S. Whitman, and Silas W. Pettit, to give notice that legal proceedings will in future be taken against all such infringers.

THE SIEMENS-LUNGREN CO., 21st St. & Washington Av., Phila., Pa.

GAS ENGINES. GAS WORKS APPARATUS AND CONSTRUCTION.

THE CLERK GAS ENGINE CO.,

Main Office, 1012, 1014, 1016, 1018 Filbert St., Philadelphia, Pa.

WM. W. GOODWIN, Prest. E. STEIN, Sec. S. LEWIS JONES, Asst. Sec. A. J. DOTY, Supt.

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GAS vs. ELECTRIC LIGHT.

We would invite attention to the able and exhaustive argument of General A. Hickenlooper, President of the Cincinnati Gas Light and Coke Company, contained in a handsome pamphlet of 96 pages, entitled

"EDISON'S INCANDESCENT ELECTRIC LIGHTS FOR STREET ILLUMINATION. REPORT OF AN ARGUMENT DELIVERED BY A. HICKENLOOPER BEFORE THE COMMITTEE ON LIGHT, MUNICIPAL COUNCIL, CITY OF CINCINNATI, JULY 22, 1886."

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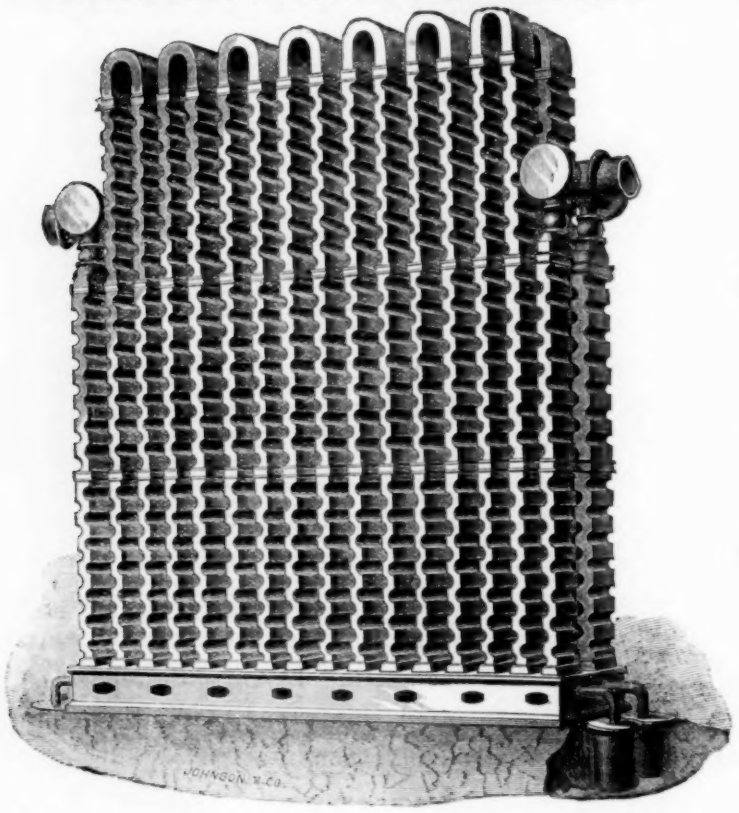

We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern. The FRICTION CONDENSER is now in use at the gas works located in the following places:

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Gloucester, Mass.	Woburn, Mass.	Attleboro, Mass.	Paterson, N. J.
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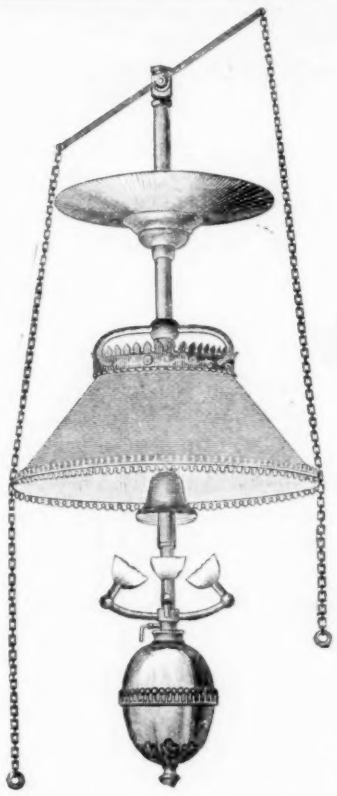

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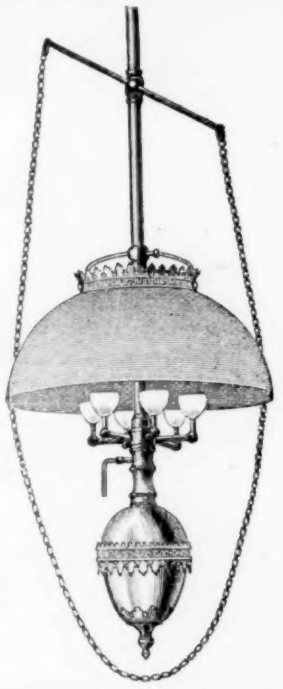

NOTICE.—Suits are pending in the United States Circuit Courts in Illinois and Pennsylvania against various parties for infringement of our Letters Patent No. 247,925, dated October 4, 1881, and No. 333,862, dated Jauary 5, 1886. The first of these suits has come up for hearing, and an injunction has been granted therein. The second of said suits has not yet been reached for hearing. All persons are cautioned against manufacturing, selling, or using any apparatus or material which infringes our Patents. We intend to prosecute all parties infringing patents owned by us.

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1886

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Elkhart Gas Light & Coke Co., Elkhart, Indiana.— Daily capacity, 120,000 cu. ft.
Madison City Gas Light Company, Madison, Wis.— Daily capacity, 120,000 cu. ft.
South Bend Gas Light Co., South Bend, Indiana.— Daily capacity, 250,000 cu. ft.
Sheboygan National Gas Comp'y, Sheboygan, Wis.— Daily capacity, 120,000 cu. ft.
Salina Gas Light Company, Salina, Kansas.— Daily capacity, 120,000 cu. ft.
Rathbun Company, Deseronto, Province Ontario.— Daily capacity, 80,000 cu. ft.
Jefferson City Gas Light Co., Jefferson City, Mo.— Daily capacity, 120,000 cu. ft.
Mankato Gas Light Company, Mankato, Minnesota.— Daily capacity, 80,000 cu. ft.
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1886

EXHAUSTERS. EXHAUSTERS. EXHAUSTERS.

THE ROOTS GAS EXHAUSTER.

CINCINNATI, OHIO, March 24, 1887.

P. H. & F. M. ROOTS, Connersville, Ind.: Gentlemen—I have the honor to say that after the continuous and uninterrupted use of your Exhausters for a period of fifteen years, it affords me pleasure to endorse them in the highest possible terms. Very respectfully,

A. HICKENLOOPER, Prest. Cincinnati Gas Co.

CINCINNATI GAS LIGHT AND COKE CO., Cincinnati, Ohio, two No. 6 Gas Exhausters, with Engine, for their new works, which, with the two No. 6 Exhausters, without Engines, at their old works, and one No. 3, with Engine for pumping, for their station at Carthage, make five Exhausters in all for this Company.

CHICAGO, ILL., March 24, 1887.

Messrs. P. H. & F. M. ROOTS, Connersville, Ind.: Dear Sirs—We have two of your No. 6 Exhausters at our works, which have been running for several months, and are giving very good satisfaction. Yours truly,

THEO. FORSTALL, Prest.

THE CHICAGO GAS LIGHT AND COKE CO., Chicago, Ill., two No. 6 Gas Exhausters and Engine combined on same bed-plate.

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Messrs. P. H. & F. M. ROOTS, Connersville, Ind.: Dear Sirs—In 1872 one of your No. 5 Exhausters was placed in these works, and worked satisfactorily. March, 1885, it was replaced by one of your No. 6 Exhausters. The latter has been in almost constant use the past two years, has worked up to all my expectations, and is to-day in apparently as good condition as when first set up. It has not cost one cent for repairs in all that time. I have also had one of your No. 1 Exhausters, with Engine on same bed-plate, fitted with your valves and Huntoon Governor, placed in a small works under my control, and in its operation it seems as near perfection as I ever expect an Exhauster to become. Without in the least disparaging Exhausters of other makes, I may say that your Exhauster may be safely recommended as unsurpassed by any other, to those requiring such machines. Yours respectfully,

FREDERIC EGNER, Eng. and Supt.

CLEVELAND, OHIO, March 22, 1887.

Messrs. P. H. & F. M. ROOTS, Connersville, Ind.: Gentlemen—Concerning the Exhauster furnished this Company by you last fall, I can say but little—indeed, much need not be said. It simply does its work perfectly, and in a way that inspires confidence that it will not shirk its duty when one's back is turned. If I wanted another 1,000,000 capacity I should try and duplicate our No. 4. Very respectfully,

EDWARD LINDSLEY, Eng. and Supt.

PEOPLES GAS LIGHT CO., Cleveland, Ohio, one No. 4 Exhauster and Engine combined on same bed-plate, Pipe Fittings, Gas and Bye-Pass Valves, Governor, etc.

INDIANAPOLIS, IND., March 21, 1887.

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JAS. SOMERVILLE, Eng. and Supt.

INDIANAPOLIS GAS LIGHT CO., Indianapolis, Ind., one No. 4 Gas Exhauster and Engine combined on same bed-plate, Pipe Fittings, Gas and Bye-Pass Valves, etc. This Exhauster has a capacity of 1,000,000 cu. ft.

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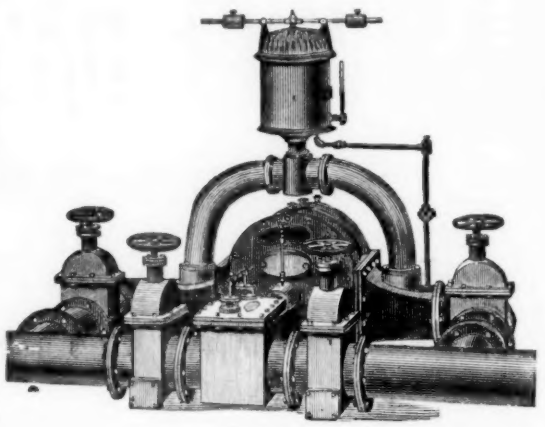

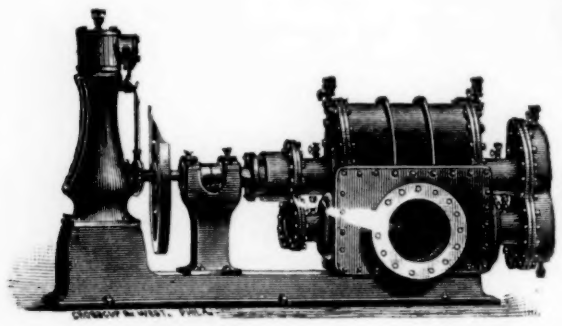

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Will Pay for Itself in Six Months! Saves Labor! Lengthens the Lives of Retorts! Prevents the Formation of Carbon! Increases the Yield from Twelve to Fifteen Per Cent.!

We find, after careful inquiry and investigation, that the majority of the Gas Works in the United States and Canada are running *without Exhausters*, which, in our opinion is due to two causes. *First.* The prices heretofore asked for Exhausters have been so high as to counteract, to a great extent, the advantages to be obtained from their use, and caused most managers to postpone their adoption indefinitely, or until their consumption had largely increased. *Second.* Many superintendents have a false impression that it will not pay to run an Exhauster in works producing less than 20,000 feet per day.

The first difficulty we overcome by selling our Exhausters at *extremely low prices*, as will readily be admitted after comparing our list with those of other manufacturers; and as to the second, we can say we have most convincing evidence from many companies operating our Exhausters that they can be used to advantage in works producing *as low as* 6,000 *cubic feet per day.*

In our improved Exhauster we combine the "Exhaust Tube" Gas and Steam Governors, Gas Compensator, and Bye-Pass Valves in the most compact form possible, which is a very great advantage to the machine, besides enabling us to manufacture and sell at the low prices given.

This is the only Exhauster in the market having a "compensator" in addition to the "gas governor"—a most important improvement, as it does away with all possible danger of their ever drawing air, and thus reducing the illuminating power of the gas.

FOR OIL GAS WORKS.

Our Exhausters are especially adapted for the use of Oil Gas Works; and where oil is required to dilute the gas a valve can be adjusted *to take the exact amount of air required*, thus dispensing with air pumps and their attendant labor and annoyance.

POINTS OF SUPERIORITY.

Requires *one-half the floor space* and *one-third less steam* than any other Exhauster in the market of same capacity. *More cheaply and easily connected*, as outside "Bye-Pass Valves" are dispensed with. It is the only Exhauster manufactured having "Compensator" and "Governor" *combined*, the "Compensator" with all other Exhausters being a separate and distinct machine. It is simple in construction, easily adjusted, not liable to get out of order, and *can be operated by ordinary workmen.*

NAPHTHALINE AND STEAM JET EXHAUSTERS.

As many superintendents of Gas Works believe the use of a Steam Jet Exhauster will inevitably cause trouble from *naphthaline* deposits, we recently sent out letters of inquiry to superintendents using our Steam Jet, asking for their experience, and the following replies speak for themselves. That naphthaline deposits are often unjustly attributed to Jet Exhausters is well known by many superintendents. When the cause cannot be determined it seems to be the rule to place the responsibility on the Jet Exhauster, *if they have one;* but if no Exhauster is used *the cause remains a mystery.*

OFFICE LISTOWEL GAS LT. CO., LISTOWEL, CAN., May 29, 1885.

Messrs. Connelly & Co., Ltd.: Gentlemen—The Exhauster purchased from you over three years ago, and now in use, has proven in every way all you claim for it, and has given us great satisfaction. No trouble has arisen from naphthaline.

Yours respectfully, F. W. HAY, Sec.

RICHMOND GAS CO., RICHMOND, KY., June 1, 1885.

Messrs. Connelly & Co., Ltd., 407 Broadway, N. Y: Gentlemen—I put in your Steam Jet Exhauster last November. I think it a perfect machine, as it requires no attention whatever. Have not had any naphthaline to contend with; it would be very easy to get rid of that substance if I had it. Yours very truly, J. B. GORDON, Supt.

HAMPTON, VA., June 3, 1885.

Messrs. Connelly & Co., Ltd.: Gents—We have been using your Steam Jet Exhauster for the past 3 years, and have never had any trouble with it whatever, either from naphthaline or any other source. Yours truly, J. B. H. GOFF.

BRUNSWICK, ME., May 27, 1885.

Messrs. Connelly & Co., Ltd.: Dear Sirs—Your favor of 23d inst. at hand. In answer would say your Exhauster works well with us. We make an oil gas; are not troubled with naphthaline. Very truly yours, B. G. DENNISON, Prest. Brunswick Gas Lt. Co.

WILMINGTON, O., June 15, 1885.

Messrs. Connelly & Co., Ltd.: Dear Sirs—We started your make of six-inch Steam Jet Exhauster March 30, and I am pleased to state, from the time the steam was turned on, it has performed its work to our entire satisfaction. We have never had any other but a Steam Jet Exhauster, and have never been troubled with naphthaline. For many reasons I prefer it to the "rotary," and have no hesitancy in recommending it.

Yours truly, E. W. HAMLIN, Sec. Gas Co.

OFFICE LOGAN GAS LT. & COKE CO., LAGAN, HOCKING CO., O., May 29, 1885.

Connelly & Co., Ltd.: Gentlemen—In answer to yours of 27th we have to say that the Steam Jet Exhauster put in for us by you last fall has been used constantly since, and, up to this time, we have had no trouble with naphthaline. We have heard many gas men say that a Steam Set Exhauster is liable to bring on trouble with naphthaline, and we have had that fear before us; but so far we have escaped, and we trust we may not have any experience with that gas manager's bugbear. Yours truly,

LOGAN GAS LT. & COKE CO.

OFFICE ATHENS GAS LT. CO., ATHENS, O., May 30, 1885.

Messrs. Connelly & Co., Ltd.: Dear Sirs—We take pleasure in giving you an unqualified endorsement of your Steam Jet Exhauster. It has been in place almost a year; been tested in all seasons and under all conditions; it has always proved true to the work assigned it. We have had no naphthaline deposit, nor any trouble chargeable to the Exhauster. Nothing but good has come from it, and *great* good at that. We can't do without it. Very truly yours, C. H. WELCH, Supt.

OFFICE MEADVILLE GAS WORKS, MEADVILLE, PA., May 29, 1885.

Connelly & Co., Ltd.: Gents—Yours of the 27th received and contents noted. Would say that after using your Steam Jet Exhauster for the past 18 months, find it perfectly satisfactory in every way. So far as naphthaline is concerned, we have had no trouble whatever as yet. Yours, GEO. S. CULLUM, Supt.

NYACK AND WARREN GAS LT. CO., NYACK, N. Y., May 25, 1885.

Connelly & Co., Ltd.: Gentlemen—Since your Jet Exhauster has been here there has been no trouble, and certainly *no naphthaline.* The only trouble I have experienced was the Jet becoming clogged with tar last week, and I cleaned it in a few minutes. It has run over three years without any trouble or cost for repairs. Yours truly,

A. MURRAY, Lessee and Manager.

OFFICE CADIZ GAS LT. CO., CADIZ, O., May 29, 1885.

Messrs. Connelly & Co., Ltd.: Gentlemen—Yours of 23d, inquiring how our Steam Jet Exhauster is doing, has been received. We have been using one of your Exhausters about four years, and with the best of satisfaction. We have less trouble with carbon in retorts, make more gas from same amount of coal than before, and have no trouble with stoppage in pipes or trouble from tar; and as regards naphthaline, we are not troubled with it, and do not know what it is to have any stoppage in pipes from naphthaline.

Very truly yours, A. N. HAMMOND, Sec.

SIDNEY (OHIO) GAS WORKS, June 1, 1885.

Connelly & Co., Ltd.: Gentlemen—We have now been using one of your Steam Jet Exhausters about five months, and thus far it has given us perfect satisfaction. We get a better yield and a more brilliant quality of gas from the coal. We have seen in papers and heard from different individuals that Steam Jet Exhausters were productive of naphthaline. "*We can't see it,*" as we have found no trace of it in the works, mains, services, or meters. Respectfully yours, W. W. GRAHAM, Supt.

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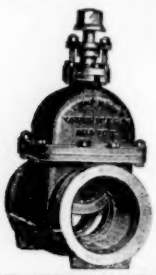

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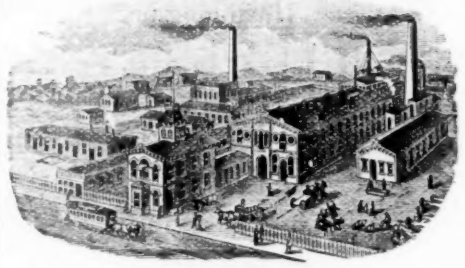

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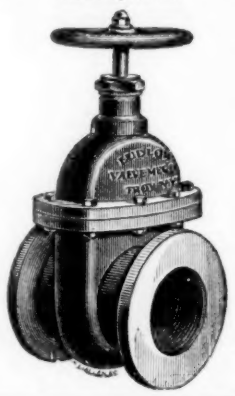

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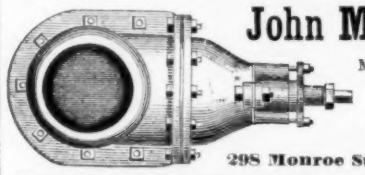

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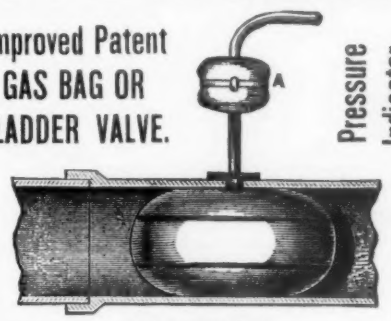

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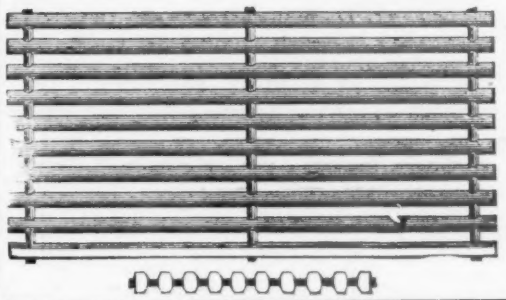

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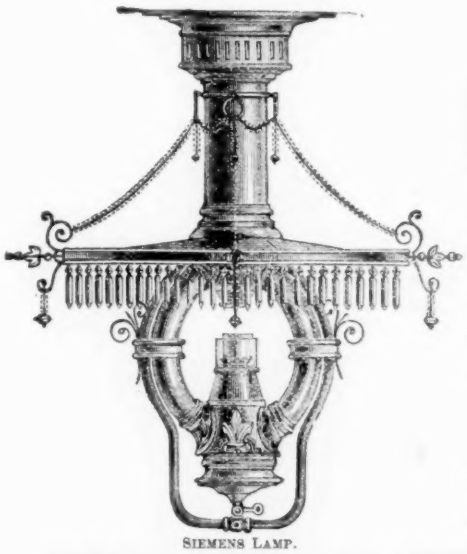

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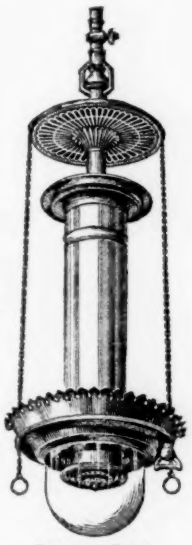

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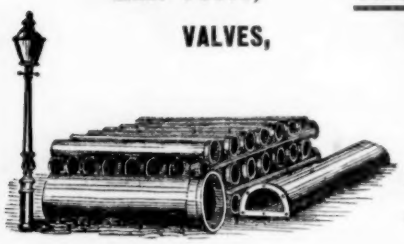

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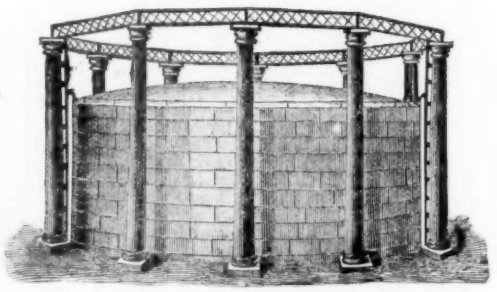

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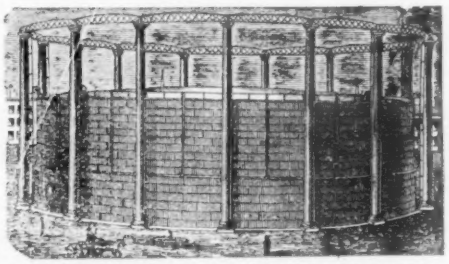

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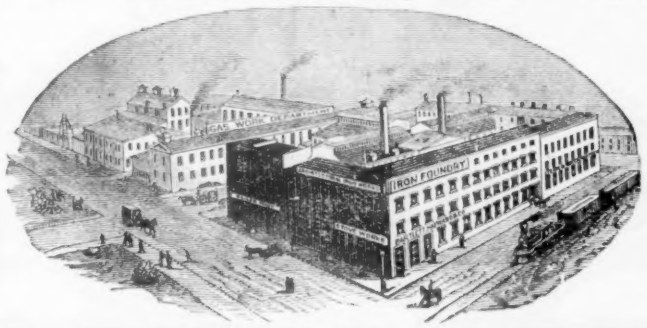

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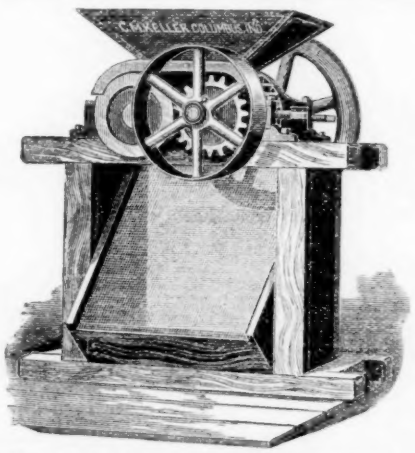

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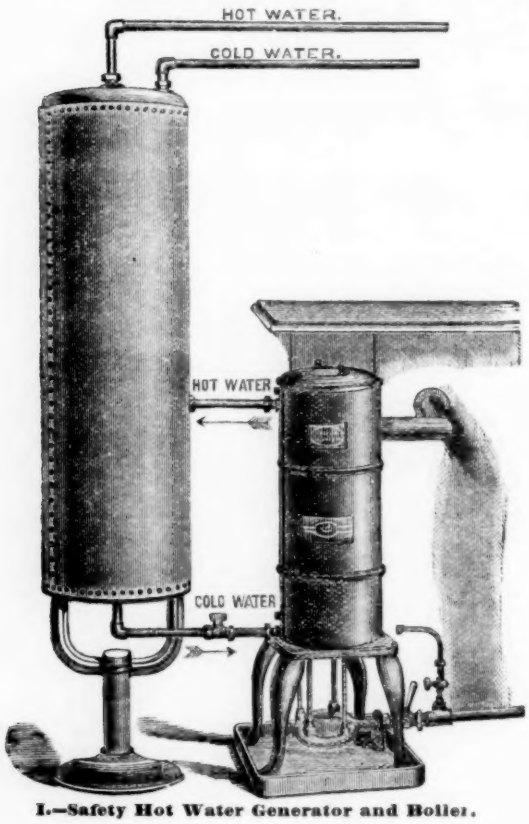

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We beg to call attention to the cast iron pan which is now attached to the legs of the Generator (see illustration). This is to catch the drippings from the Coil, which many persons suppose come from a leak, when in fact they are produced by condensation. This condensation is caused by the hot flame coming in contact with the coil filled with cold water.

New Style Gas Cooking Stove.

Cut II. represents our New Style Cooking Stove. As will be seen, it has an ornamented cast iron base and front, and extension shelves. The oven burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent applied for). The ovens are of greater capacity than those of the old style. The top, in conjunction with the outlet pipe, is designed to carry off all products of combustion; hence the outlet pipe must be connected with a flue, or the stove will not work properly.

This Stove has 4 boiling burners in top of hot plate. All fittings are nickel plated. We are making this style of Cooking Stove in the following sizes—viz., No. 7 B, No. 8 B, No. 9 B, and No. 10 B.

III.—Improved Hot Plate, No. 108.

New Style Hot Plates.

Cut II. represents our New Style of Hot Plates, of which we are making No. 106 (two small boiling burners), No. 107 (two medium sized boiling burners), and No. 108 (two medium and one large boiling burner). See new Catalogue and Price List for further particulars.